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NOV 1 - 1927

Volume 25. No. 11 NOVEMBER, 1927

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post office at New York under the Act of 1889.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN ST., NEW YORK, U. S. A.

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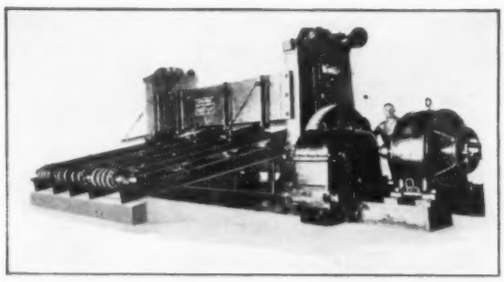

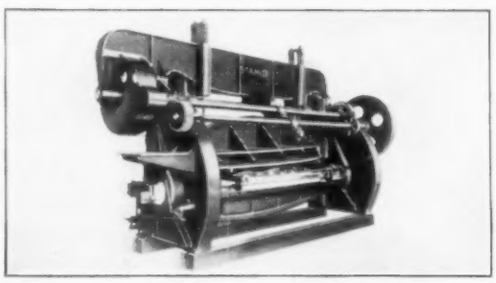

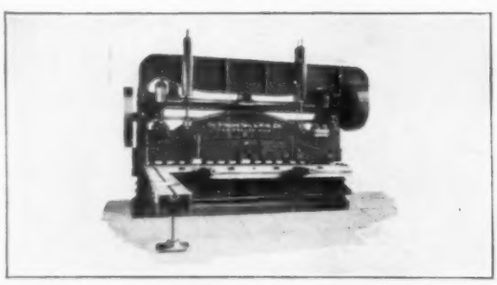

THE Streine Tool & Mfg. Co., New Bremen, Ohio, makers of The Stampco Line of machinery for steel, sheet and plate mills, write us that one of the mechanical monsters shown here weighs 135,600 pounds ringside—all finished with Egyptian Lacquer—on which the Streine folks have standardized.

We modestly submit that this is considerable volume of evidence about Egyptian Lacquer. (Further evidence, if you read your "Metal Industry" as regularly as you should!) We leave it to you: *Why do* leading makers of fine products who are proud of what they make, use Egyptian Lacquer—standardize on it?

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THE
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Vol. 25 NEW YORK, NOVEMBER, 1927 No. 11

The Ford Lead Reclaiming Plant

Battery Lead Smelting Plant at the Highland Park Plant of the Ford Motor Company, Detroit, Mich.

Written for The Metal Industry by F. J. HUNTLEY, Detroit, Mich.

Owing, it is said, to the scarcity of new sources of lead ore deposits in this country, battery lead reclamation is being developed to its highest possible point at the Highland Park plant of the Ford Motor Company. It is announced that an average of 120,000 pounds of battery scrap consisting largely of lead in some form or other is handled daily at the Ford plant and made ready for use again.

Large amounts of this scrap are purchased in the eastern and north central states by persons who operate from the Ford branch plants in these particular sections. Regular calls are made at the service stations in their respective territories where old batteries are picked up, prices being based on the prevailing lead market.

Scrap arriving at the smelter is unloaded into hopper-type dump cars operating on an industrial track which terminates beneath an overhead monorail system, 150 feet long, extending parallel with the railroad. Here a

FIG. 1. MONORAIL 2-TON CRANE CARRYING SCRAP TO CHARGING FLOOR

two-ton crane either lifts it direct to the charging floor of the smelter or deposits it in stock. About 500,000 pounds of battery scrap are carried at all times.

On the charging floor the scrap is weighed on a platform scale into containers. About 325 pounds are placed in each. A monorail hoist distributes the weighed scrap along a line of eight reduction furnaces of the verticle shaft type. No attempt is made to separate the relatively small proportion of wood and rubber from the lead. All is charged into the furnace.

An average furnace charge consists of 325 pounds of scrap and 20 pounds of charcoal. Once started, the furnaces are kept loaded to the top. The bottom of the charge rests on a nickel chromium alloy grate about four feet above the furnace floor. In the center of this grate are five holes through which the lead, as it melts, reaches the bottom of the furnace, whence it runs down a spout into a pot.

The average operating temperature of a smelting furnace is 1,200 degrees Fahrenheit. Air blasts, entering at four tuyeres a short distance above the grate, perform with the charcoal the important function of turning the litharge and red lead back into metallic lead. No tapping is required. The metal issues from the spout in a continual thin stream. A low-pressure gas flame at the point where it emerges from the furnace keeps it soft.

An employe, at frequent intervals, stirs up the charge immediately above the grate and opens the holes through which the melted lead reaches the furnace bottom. This is necessary to prevent caking of material above the grate. Often, too, the residue of charcoal and scrap which falls to the bottom is raked from the furnace and pushed through an opening in the floor onto a drag conveyor. It is thus carried to a point where a bucket elevator lifts it to the charging floor for further treatment.

From pots beside the furnace the metal is run into a one-ton ladle operated on a nonorail system, and then is taken to three alloy pots, holding twenty-tons each, into which it is poured. Gas flames keep these pots at a temperature of about 800 degrees Fahrenheit. Here the dross is skimmed, cooled, and afterward carried in the bucket elevator to the charging floor for further treatment.

A highly carbonaceous flux is burned on the surface of the lead in the alloy pots. This operation eliminates both the oxides which have survived the reduction processes

and those which have formed on the metal since its removal from the furnace.

A chemist then takes samples of the metal in the alloy pots and no lead is removed for any other purpose until

FIG. 2. LADLING LEAD FROM FURNACE

the laboratory has rendered a report on its purety and antimonial content. Following this report the metal is rectified to suit production needs.

The output of the furnaces totals 40,000 pounds in eight hours. They are operated two shifts per day, giving them a total daily producion of 80,000 pounds. Two cupolas, which are employed in treating residue, or dross, produce 40,000 pounds of metal in eight hours, and operate one shift per day.

It is necessary to have the cupolas idle for two shifts daily, so that they may be re-bricked and cleaned.

A cupola charge consists of 75 pounds of coke; 300 pounds of dross; 45 pounds of limestone; 25 pounds of mill scale, and 15 pounds of fluorspar. An air pressure of from 10 to 16 ounces is maintained during operation. The cupolas are tapped at intervals, as in iron casting, as generally practiced.

The stacks of both cupolas and furnaces are connected with a manifold which is under reduced pressure from a vacuum fan. Hoppers between stacks furnish places of accumulation for the larger metallic particles carried out in the exhaust gases. The remainder are drawn into a cooler where lighter particles are precipitated by means of showers of water and baffle plates into a tank at the bottom of the structure. The fumes pass from here into an electric precipitator, where they flow between plates and wires, of which the latter are charged with an alternating current of 65,000 volts, made undirectional by the use of a rectifier. The microscopic particles still remaining in the fumes become electrically charged.

Between the pulsations of the current the particles are attracted by the plates, which are oppositely charged, and adhere to their surface. At 20-minute intervals the current is shut off and the particles thus arrested are removed. The exhaust gas is expelled from a vertical stack.

There are two pig casting machines at the smelter. One is usually employed on post lead, the other on lead for grids. Each consists of a tank equipped with a spout and an automatic shut-off, and a conveyor the links of which carry the molds in which the pigs are formed. The lead is transferred into the pig castings tanks by portable centrifugal pumps. Gas flares keep the metal soft in the

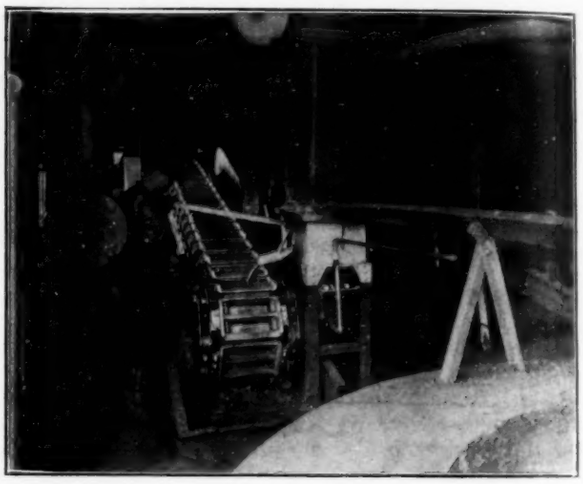


FIG. 4. POURING PIGS OF LEAD

tank and at other points where there is a chance of its coating. Moisture in the molds of the pig conveyors is eliminated by gas flares burning beneath them.

With a single pig casting outfit working, 20 tons of metal may be cast in about three hours.

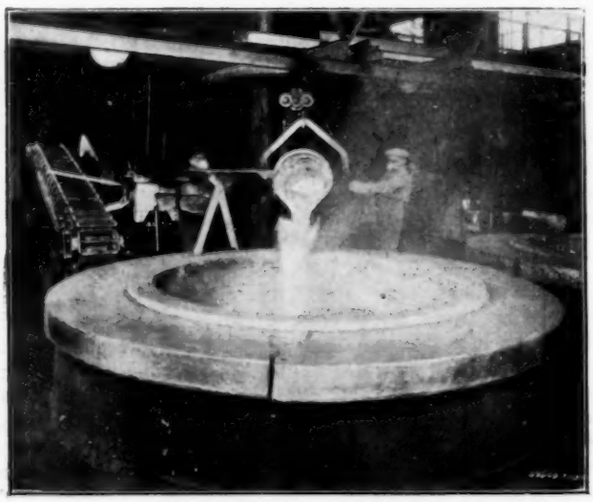


FIG. 3. POURING LEAD INTO 20-TON POTS

Casting Soft Metal

Q.—While in your office I mentioned that our firm would like to find a combination with plaster of paris or another substitute for plaster of paris with which to make molds for castings with lead mixtures. Our difficulty with plaster of paris is that it cracks so readily when heated and the molds do not last very long.

A.—There are a number of formulas for plaster molds, but none that will make many castings. There is a patented formula, No. 1,281,679, composed plaster paris, 40%, asbestos 30%, brick dust 30%; then another that is said to be good is No. 1,418,750. Take asbestos, preferably that which is free from lime, use linseed oil as a binder and subject to hydrostatic pressure. This will make a smooth casting that needs no finish. Another mixture said to give excellent results is plaster paris 90% and lime 10%. This mixture is dried in an oven and is good only for one casting.

If you are pouring soft metal why not use a brass mold? You will find it much more satisfactory and far less expensive. That is what most people use for soft metal. Casting in plaster is not satisfactory.—W. J. REARDON.

Manganese Bronze Specifications

United States Government Proposed Master Specification for Manganese Bronze Rods, Bars, Shapes and Plates.

The Federal Specifications Board, Washington, D. C., is adopting and promulgating purchase specifications for commercial commodities purchased by the various departments and establishments of the United States Government.

These specifications, in the formative stage, are submitted to representative manufacturers for their comment and criticism.

The Federal Specifications Board would be glad to receive any comments or suggestions as to changes which may be thought to be desirable in the specification. Such comments or criticisms will have to be received by the Board not later than November 25, 1927.

I. GENERAL SPECIFICATIONS

United States Government General Specification for Metals, Federal Specifications Board Specification No. 339, in effect on date of invitation for bids, shall form part of this specification.

II. GRADES, FORMS AND TEMPERS

This specification covers one grade of manganese bronze in the following forms and tempers:

Rods, soft, half hard and hard.
Bars, soft, half hard and hard.
Shapes, soft.
Plates, soft and half hard.

III. MATERIAL AND WORKMANSHIP

1. Manganese bronze shall be made only from the best grades of virgin metals, or from virgin metals and scrap of known and approved composition.

2. The material shall be uniform in quality and temper, clean, sound, smooth, commercially straight or flat, and free from pipes, slivers, laps, cracks, twists, seams, scale, damaged ends or edges, buckles and other injurious defects, and shall be sufficiently annealed or treated before delivery to insure freedom from strain cracks or so-called "season cracking."

3. When specified in the contract or purchase order, plates shall be supplied with finished edges, as detailed hereinafter.

IV. GENERAL REQUIREMENTS

See Detail Requirements, Section V.

V. DETAIL REQUIREMENTS

1. The chemical requirements are as shown in Table 1.

TABLE 1—CHEMICAL COMPOSITION

Copper per cent	Zinc percent	Tin per cent	Iron per cent	Manganese maximum per cent	Aluminum maximum per cent	Lead maximum per cent	Other impurities maximum per cent
57-60	Remainder	0.5-2	0.8-2	0.50	0.25	0.20	0.10

2. Tensile Strength.—The requirements as to tensile strength are as shown in Table 2.

3. Special tempers not covered in Table 2 may be agreed upon between the contractor and purchaser, in which case they will be specifically defined and designated in the contract or purchase order.

4. Material shall withstand bonding cold, without check or fracture on the outside of the bent portion, through the angle specificed in Table 2, on a radius equal to the diameter or thickness of the material.

5. All rods and bars shall withstand being hammered hot to a fine point.

6. Specimens of material shall withstand immersion for 15 minutes without cracking in an aqueous solution containing 100 grams of mercurous nitrate and 13 c.c. of nitric acid (specific gravity 1.42) per liter.

7. Permissible Variations, Rods Bars and Shapes:

(*a*) Rods and Bars, except forging stock, measured on their diameters or between parallel faces, shall not vary from the specified dimensions by more than the amounts shown in Table 3.

TABLE 2—PHYSICAL PROPERTIES

Diameter or thickness	Tensile Strength: Tensile strength, pounds per sq. inch minimum	Tensile Strength: Yield point, pounds per sq. inch minimum	Elongation in 2 in. minimum percent	Bend test degrees
Rods and bars, soft:				
All sizes	.....	.....	..	180
Rods and bars, half hard:				
1 and less	72,000	36,000	20	120
1.001 to 2.50	70,000	35,000	25	120
2.501 and over	65,000	32,000	30	120
Rods and bars, hard:				
1 and less	85,000	60,000	10	90
1.001 to 2.50	83,000	57,000	15	90
2.501 and over	80,000	54,000	20	90
Shapes, soft:				
All sizes	55,000	22,000	25	180
Plates, soft:				
0.50 and less, up to 30 inches wide	57,000	22,000	20	180
0.50 and less, over 30 inches wide	56,000	22,000	25	180
0.50 and over, all widths	56,000	22,000	25	180
Plates, half hard:				
0.50 and less, up to 30 inches wide	60,000	24,000	18	120
0.50 and less, over 30 inches wide	58,000	23,000	22	120
0.501 and over, all widths	58,000	23,000	22	120

Note—Rods and bars, soft are intended for reforging.

TABLE 3—PERMISSIBLE VARIATIONS IN DIAMETER OR THICKNESS, RODS AND BARS, EXCEPT FORGING STOCK

Diameter or thickness, inches	Permissible variations, inch: Rounds	Permissible variations, inch: Recangular, Square, Hexagonal, etc.
0.50 and less	±0.0015	±0.0030
Over 0.50 to 1, inclusive	± .0020	± .0040
Over 1 to 2.5 inclusive	± .0025	± .0050
Over 2.5	± .0030	± .0060

(*b*) Rods or bars for forging, measured on their diameters, or between parallel faces, shall not vary from the specified dimensions by more than the amounts shown in Table 4.

TABLE 4—PERMISSIBLE VARIATIONS IN DIAMETER OR THICKNESS, RODS AND BARS, FORGING STOCK

Diameter or thickness, inches	Permissible variations for all sections, inch
0.50 and less	±0.007
Over 0.50 to 1, inclusive	± .010
Over 1 to 2.5, inclusive	± .015
Over 2.5	± .022

(*c*) Unless the contract or purchase order expressly stipulates that rods and bars are intended for forging, it shall be understood that the permissible variations specified in Table 3 shall apply.

(*d*) For shapes, the permissible variation shall be as specified in the contract or purchase order.

(*e*) Round bars, except forging stock, shall not be out of round more than one-half the permissible variation in diameter stated in Table 3.

(*f*) Square, rectangular, and hexagonal rods, bars and shapes shall have practically exact angles and shall have sharp corners, unless otherwise specified.

(*g*) Rods, bars and shapes of all sizes may be ordered to exact lengths, in which case a variation of plus ⅛ inch on length shall be permitted.

(*h*) When rods and bars 1 inch or less in diameter or thickness are ordered in stock lengths, the pieces shipped shall be cut to the nominal or stock length as a maximum. The shortest acceptable lengths, and the maximum permissible percentage by weight of short lengths in any one shipment shall be as shown in Table 5.

TABLE 5—PERMISSIBLE VARIATIONS IN LENGTH OF RODS AND BARS

Nominal or stock length, feet	Shortest acceptable length	Maximum permissible percentage by weight of short lengths
20	12	80
18	10	80
16	10	80
14	8	80
12	8	40
10	6	40
8	6	40
6	4	40

(*i*) Unless exact lengths are specified, rods and bars over 1 inch, to and including 2 inches in diameter or thickness, will be acceptable in random lengths of 4 to 10 feet, but in no case shall more than 40 per cent of lengths shorter than 10 feet be accepted.

(*j*) Rods and bars over 2 inches in diameter or thickness will be ordered in special lengths.

8. Permissible Variations, Plates:

(*a*) The permissible variations in thickness for plates 0.460 inch or less thick and 20 inches or less in width shall be as shown in Table 6.

TABLE 6—PERMISSIBLE VARIATIONS IN THICKNESS OF SHEETS AND STRIPS. INCHES, PLUS OR MINUS

Thickness: B. and S. gauge No.	Thickness: Inch	Up to 6 inches wide, inclusive	Over 6 to 9 inches wide, inclusive	Over 9 to 14 inches wide, inclusive	Over 14 to 20 inches wide, inclusive
0000	0.460	0.0054	0.0056	0.0059	0.0061
000	.4096	.0053	.0055	.0058	.0060
00	.3648	.0051	.0054	.0056	.0059
0	.3249	.0050	.0053	.0055	.0058
1	.2893	.0049	.0051	.0054	.0056
2	.2576	.0048	.0050	.0053	.0055
3	.2294	.0046	.0049	.0051	.0054
4	.2043	.0045	.0048	.0050	.0053
5	.1819	.0044	.0046	.0049	.0051
6	.1620	.0043	.0045	.0048	.0050
7	.1443	.0041	.0044	.0046	.0049
8	.1285	.0040	.0043	.0045	.0048
9	.1144	.0039	.0041	.0044	.0046
10	.1019	.0038	.0040	.0043	.0045
11	.0907	.0036	.0039	.0041	.0044
12	.0808	.0035	.0038	.0040	.0043

(*b*) The permissible variations in thickness for all plates of all thicknesses and widths not covered in Table 6 shall be as shown in Table 7.

TABLE 7—PERMISSIBLE VARIATIONS IN THICKNESS OF PLATES

Width, Inches	Permissible variation, per cent: Plus	Permissible variation, per cent: Minus
Up to 48 inclusive	5	5
Over 48 to 60 inclusive	5	7
Over 60	5	8

(*c*) The permissible variations in width for plates shall be as shown in Table 8.

TABLE 8—PERMISSIBLE VARIATIONS IN WIDTH OF PLATES

Width, Inches	Permissible variation, inch: Plus	Permissible variation, inch: Minus
14 and less	0.050	0
Over 14	.125	0

(*d*) Plates of all sizes may be ordered to exact lengths, in which case a variation of ½ inch in length shall be permitted.

(*e*) When plates up to 12 inches wide are ordered in stock lengths, the pieces shipped shall be cut to the nominal or stock length as a maximum. The shortest acceptable lengths, the maximum permissible percentage by weight of short lengths and the required percentage by weight of stock lengths in any one shipment shall be as shown in Table 9.

TABLE 9—PERMISSIBLE VARIATIONS IN LENGTH OF PLATES UP TO 12 INCHES WIDE

Nominal or stock length, feet	Required per cent by weight of stock lengths	Maximum permissible percent by weight of short lengths: 8 to 10 feet	6 to 8 feet	4 to 6 feet	2 to 4 feet	Under 2 feet
10	60	40	30	20	10	0
8	70	..	30	20	10	0
6	80	..	..	20	10	0

(*f*) Finish.

(1) When finished edges of plates are specified in the contract or purchase order, the following descriptions shall apply:

"Square edge" material shall be supplied with finished edge, with sharp, square corners, without bevel or rounding of any sort.

"Round edge" material shall be supplied with finished edge, semicircular in form, the diameter of the circle forming the edge being equal to the thickness of the material.

"Round corners" material shall be supplied with

square finished edges and corners rounded to a definite radius which, unless otherwise specified in the contract or purchase order, may be any radius less than one half the thickness of the material.

(2) When no description of a required form of edge is given, it shall be understood that edges such as wood result from slitting, sawing or shearing will be acceptable.

VI. METHOD OF INSPECTION AND TESTS

1. When check analyses are made, samples for check analyses shall be obtained from each lot of 5,000 pounds or fraction thereof, of each size in the shipment, at least four representative pieces being taken. From the pieces so selected, equal amounts of clean chips shall be obtained and the chips combined and thoroughly mixed. The inspector shall forward for analysis not less than 2 ounces of the resultant mixture.

2. Unless otherwise specified in the contract or purchase order, one tension, one bend, one hammer and one strain test shall be made for every lot of 5,000 pounds or fraction thereof of each size in the shipment. The tension test specimen and the bend test specimen to represent a given lot shall not be selected from the same piece.

3. Tension Tests.

(*a*) All rods, bars and shapes may be pulled in full size when practicable. When a machined specimen becomes necessary, enough metal may be removed from the gage section to meet the limitations of the testing machine or the specimen may be machined to the form and dimensions of Type 1, United States Government General Specifications for Metals.

(*b*) For rods, bars and shapes up to 1½ inches in diameter or thickness, the axis of the test specimen shall coincide with the central axis of the piece; over 1½ inches, the axis shall be located midway between the center and the surface of the piece.

(*c*) The test specimen for plates shall be machined to the form and dimensions of Type 2, United States Government General Specification for Metal.

(*d*) The axis of tension test specimens shall be parallel to the direction of rolling or drawing.

4. Bending Tests.

(*a*) Bending test specimens from rods, bars and shapes may be the full size of the section as rolled, or may be machined to the form and dimenions indicated in paragraph 27, United States Government General Specification for Metals. When polygonal sections are bent in full size, the edges may be rounded to 1/16 inch radius.

(*b*) Bending test specimens from plates may consist of a strip from 1 to 2 inches wide by 6 to 12 inches long, with edges rounded to 1/16 inch radius, or may be machined to the form and dimensions indicated in paragraph 27, United States Government General Specification for Metals.

(*c*) The axis of all bending test specimens shall be parallel to the direction of rolling or drawing.

(*d*) Specimens shall be bent cold, by either pressure or blows.

5. Hammer tests shall be made when deemed advisable by the inspector.

6. Strain Tests.—

(*a*) Strain test specimens shall be the full cross section size of the material. At least six inches of the specimen shall be immersed in the solution.

(*b*) The specimen shall receive no annealing, bending, springing, polishing, or other preparation preliminary to this test.

VII. PACKING AND MARKING OF SHIPMENTS

1. All material shall be properly separated by size when loaded for shipment.

2. Rods, bars and shapes may be bundled for shipment.

3. Each bundle, box or crate shall be legibly and indelibly marked with the dimensions, weight and temper of contents, name, brand or trade-mark of contractor and the contract or purchase order number.

VIII. NOTES

1. Round, square, hexagonal, etc., sections are classed as rods. Rectangular sections having greater width than thickness are classed as bars. All other sections are classed as shapes.

2. The thicknes of plates shall be stated in decimals of an inch.

3. Plates shall be ordered in as narrow widths as can be used.

4. The material covered hereby is suitable for purposes requiring great strength and incorrodibility, such as valve stems, propeller blade bolts, air pumps and condenser bolts, etc., and may be used in lieu of Tobin bronze and naval brass where higher strength is required.

5. The grade of manganese bronze covered herein is not commercially available in sheet and strip form, nor in any thickness less than ⅛ inch. Plates are generally furnished hot rolled. For purposes of calculation the weight per cubic inch may be taken as 0.304 pound.

6. U. S. Army Specification No. 57-166 was considered in the preparation of this specification.

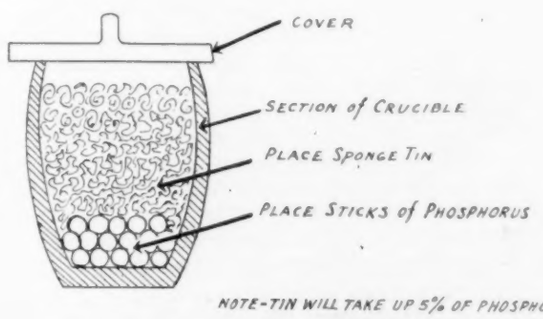
Phosphorizing

By W. J. Reardon

Q.—We are very anxious to learn how to make phosphor copper and phosphor tin.

A.—There is not much of a trick in making phosphor tin and copper. Phosphor tin is made by first sponging the tin by melting and pouring in water. Then take 6% phosphor cake and dip in the blue vitriol to coat the phosphorus. Then place the phosphorus in the bottom of a crucible and cover with the sponge tin, similar to sketch. Place on the side of furnace and cover. The heat will set off the phosphorus and melt the tin. It will not take up over 5% tin.

The phosphor copper is made in a large furnace by first melting the copper. Coat the phosphor cake same as described for tin. Place in a crucible phosphorizer and plunge in the bath of metal. Considerable skill is required. Engage an experienced man for this work.



CHARGE FOR PHOSPHOR TIN

Smelting Secondary Aluminum and Aluminum Alloys

A Series of Articles on the Reclamation of All Forms of Scrap and Used Aluminum and Aluminum Alloys. Part 7. Practice in Smelting Various Kinds of Scraps.*

Written for The Metal Industry by Dr. ROBERT J. ANDERSON, Consulting Metallurgical Engineer

In Part 6 of this series of articles, the methods of treating aluminum and alloy scraps prior to smelting were taken up, while in the present article the furnacing process is described. Practice in smelting the various aluminum scraps for the production of merchantable metal is still rather diverse, and standardization has come rather slowly. The larger smelters, however, are gradually adopting the method of handling in large lots and hence using furnaces of large capacity. The actual furnacing of the scraps depends more or less upon the kind of scrap to be run. In American practice, fluxes of one kind or another are normally used in running drosses and borings. Considerable experimental work has been carried out with various methods for obtaining high recoveries from drosses and borings, but unfortunately much of this has been of little value because the amounts of materials dealt with were too small. Experimental smelting work on aluminum must be translated to a scale commensurate with plant practice before the value of any given method can be fully determined.

As is well known, various methods for the recovery of aluminum-bearing wastes have been suggested in the periodical and patent literature. The principal processes suggested have already been indicated in Part 5 of this series of articles and need not be listed again here. While the preliminary treatment of certain scraps is essential and necessary to economical operation, the actual furnacing method is the most important part of the recovery process. Various types of furnaces have been, and are, used in secondary aluminum work, including coke-fired pit furnaces, stationary and tilting crucibles, stationary and tilting iron pots, reverberatories, and open-flame tilting furnaces. Electric furnaces have not been used commercially either in the United States or abroad for aluminum scrap recovery, although several different types have been tried experimentally. All the different furnacing methods that have been used in practice for the several kinds of scraps cannot be discussed in detail here, and only a few typical methods of handling will be described.

PRACTICE IN SMELTING DROSSES.

As indicated in Part 6, the drosses originating in melting aluminum and aluminum alloys require proper preliminary treatment prior to furnacing in order to obtain good recoveries. Of course, so-called bright (rich) dross lumps require no preliminary treatment, and this material may simply be melted like heavy casting scrap. All-aluminum drosses may be run directly into secondary aluminum pig, or used in blending. Drosses from aluminum-alloy melts of the same composition may be run directly into secondary aluminum-alloy pig of the same approximate composition. In the case of miscellaneous lots of drosses, i.e., skimmings from various sources and varying widely in composition, extraction and pigging of the metal is the proper procedure. After this, definite alloys can be made up readily. The term drosses as used just above connotes dross concentrates from the preliminary treatment of drosses as received. The smelting operation on dross concentrates can be carried out in any type of furnace that lends itself readily to hand puddling; crucible, iron-pot, and reverberatory furnaces are used in practice. Irrespective of the type of furnace used, good recovery in running dross concentrates depends upon proper fluxing and the reclamation of the metal from the skimmed dross plus flux taken off during the operation. It is, of course, understood that some small smelters run drosses directly without preliminary crushing treatment and removal of the great bulk of oxide, but this practice is very poor.

In one plant, dross concentrates from a preliminary treatment process are puddled into a liquid heel in a pit crucible furnace using cryolite as the flux, additional dross being charged from time to time as the melt goes down in the crucible. Dross taken off from the heat is air quenched, crushed, screened, and remelted. In another plant, the concentrates are run in an iron-pot furnace, using ammonium chloride as the flux. In reverberatory-furnace practice, concentrates from a treatment process are smelted under a liquid (molten) flux cover of 85:15 sodium chloride-calcuim fluoride, of sodium chloride plus a variable percentage of cryolite, or other suitable flux. In starting the operation, the concentrates may be charged to a liquid heel, and fresh additions are puddled into the bath with thorough working. When the furnace is full, the metal is run out through the tap hole from beneath the slag overlayer, and later the slag is run to waste.

When running dross concentrates with a dry flux (i.e., not molten), the dross arising in the operation may be skimmed into a slag buggy and there puddled. While this hot mass is being worked up in the buggy, cold dross may be added to lower the temperature. The metal contained in the mass collects in the bottom of the buggy; the overlayer of dross is removed, spread out in a thin layer to air quench, and the metal is pigged. When cold, this quenched dross is screened, and the coarse material that still contains metal is returned to the furnace.

Recovery in the smelting of dross concentrates, borings, or other fine scraps by the dry-flux process depends upon proper pudling at the "reacting temperature," so-called, and upon subsequent handling of the skimmed dross in the slag buggy. The reacting temperature may be defined as the temperature at which the thermit-like reaction begins, and this is about 850° C. In practice, the reacting temperature is considered to be reached when the heated mass begins to glow in spots, and it is difficult to determine pyrometrically the precise temperature at which this begins.

Fig. 1 shows a flow sheet of the operations required in the preliminary treatment and smelting of aluminiferous drosses and skimmings, when using a liquid flux cover. There may, of coure, be more than one screen used.

PRACTICE IN SMELTING BORINGS.

Generally speaking, the handling of aluminum-alloy borings for the production of pig metal is more simple than is the case with drosses, particularly as regards preliminary treatment. If borings are clean and dry, no preliminary treatment is necessary, other than removal of free iron by magnetic separation. The problem in run-

* Parts 1, 2, 3, 4, 5, and 6 were published in our issues of January, 1925, September, 1925, February, 1926, May, 1926, November, 1926, and July, 1927, respectively.

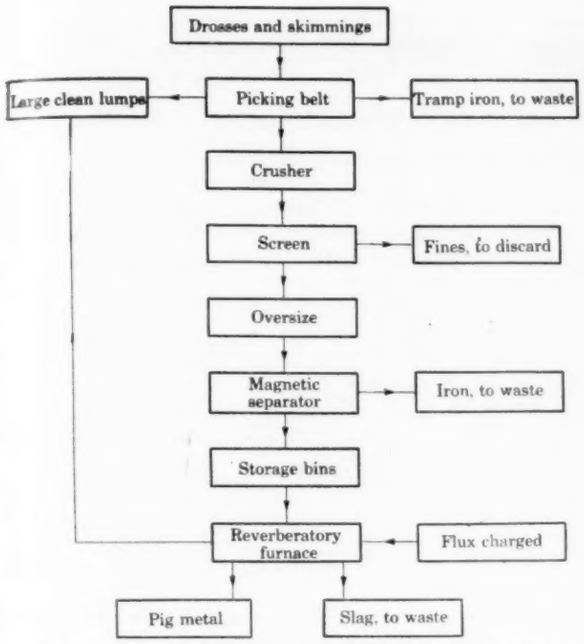


FIG. 1. FLOW SHEET SHOWING SCHEME FOR SMELTING ALUMINUM DROSSES

ning borings (as is the case with dross concentrates) is to prevent oxidation of the small particles of metal so far as possible and to force coalescence of the melted globules into a large mass of metal. As in the case of drosses, the furnacing of borings is variable, and the operation is usually one of puddling, skillful manual labor being necessary. The method of puddling borings into a liquid heel is used considerably and with good results as to recovery. Borings of a given composition may be run directly into secondary aluminum alloys with suitable blending in of other scraps if necessary. (The question of blending practice will be discussed in Part 8 of this series, to be published later). If borings are received as mixed lots of various compositions, the safest method is to run batches of the borings into pigs, and analyze the resultant lots. Then, definite alloys can be made up by re-melting.

In one plant, borings are puddled into a liquid heel in a crucible furnace using cryolite as the flux, additional borings being charged as the melt goes down. Dross removed during the melting is taken off, air-quenched, crushed, screened, and the oversize re-melted. In another plant, borings are mixed with 15 to 30 per cent by weight of the 85:15 sodium chloride-calcium fluoride flux, charged into crucible furnaces, and puddled and poked during the melting. The dross removed is re-treated for metal. In the so-called dry process of running borings, the scrap is mixed with zinc chloride, and charged into small stationary iron-pot furnaces (generally 200 to 300 lbs. capacity). The temperature is held low so that the mass remains pasty and mushy, and the charge is worked over constantly. When the entire pot is full of a pasty mush, the temperature is raised, the dross removed, and the batch poured into ingots. Other small-scale methods might be mentioned. In passing, it may be said that the dry process, as described above, is employed by one large smelter, although this and other small batch methods possess decided disadvantages.

In reverberatory-furnace practice, batches of 5 to 10 tons of borings are run at a time. The operation may be conducted under a liquid flux cover to prevent oxidation, and the borings are puddled into a liquid heel through the cover. Dry covers may also be used. In general, the method is the same as that described above for the reverberatory treatment of dross concentrates. Boring melts may be blended with heavy casting scrap, aluminum clippings, and other scraps as may be required.

Grindings are puddled into a liquid heel, the foreign admixed emery or other abrasive particles being slagged off. The recovery on smelting grindings is low, due to the strong tendency of the particles to oxidize and the difficulty of inducing coalescence.

Fig. 2 shows a flow sheet of a recovery scheme for the treatment and smelting of borings, using a liquid (molten) flux cover in the furnace.

REMELTING HEAVY CASTING SCRAP.

In the treatment of heavy casting scrap, the material is simply re-melted in a furnace. There is a variable shrinkage loss in running old casting scrap, due to adhering dirt, oil, and other foreign matter, as well as oxidation loss. Heavy scrap has been run in various types of furnaces, but the type preferred by the secondary smelter is the large reverberatory of 5 to 10 tons capacity. A liquid flux cover is not ordinarily used in melting heavy castings scrap, but the melt is skimmed of dross after treatment (at the end of the heat) with zinc chloride or other suitable flux. The dross removed is re-worked for metal. Heavy scrap of known composition may be run directly into aluminum-alloy pig, and such scrap may also be used in blending with other scraps to make the particular alloys desired.

REMELTING FABRICATING SCRAP.

New aluminum sheet clippings and good quality aluminum-fabricating scrap may be run directly into secondary 98-99 per cent aluminum pig, or used in blending, as desired. Clippings and other loose fabricating scrap should preferably be baled into hard compact bundles

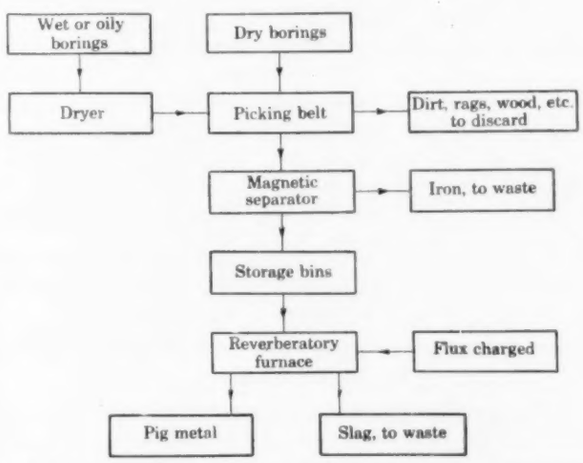


FIG. 2. FLOW SHEET SHOWING SCHEME FOR SMELTING ALUMINUM BORINGS

before charging. Loose scrap is bothersome to handle, and oxidation losses tend to be high with light scrap unless baled. Large tonnages of light aluminum scrap are best handled in large reverberatory-type furnaces. In recent years, the use of secondary aluminum has considerably diminished due to the scarcity of aluminum clippings and similar scraps, and the lack of sufficient spread between the price of the clips and of secondary metal made therefrom (or of primary metal). Hence, fabricating scrap is being used largely in making up alloys, for diluting impurities in batches, and in blending practice.

Alloy sheet scrap is generally worked into large heats of aluminum alloys and diluted with commercially pure aluminum (either new metal or clippings). In American practice, most of the alloy sheet scrap consists of the 98.5:1.5 aluminum-manganese alloy and duralumin as well as so-called "strong alloys." Duralumin sheet scrap and clippings are readily disposed of by working into heats of secondary casting alloys, e.g., No. 12 alloy, but the manganese content of the "hard-sheet aluminum" must be greatly diluted, since an appreciable percentage of manganese in a casting alloy noticeably increases the shrinkage.

SMELTING MISCELLANEOUS SCRAP

The various other scraps received by the smelter, and not already discussed above, are treated in the recovery plant according to their nature and in such manner that they can best be worked into heats. Miscellaneous aluminum scraps, such as wire, old sheet, utensils, etc., may be run into secondary aluminum pig, used for making up alloys, or disposed of by blending. The loss in melting these various scraps depends upon their condition and the furnacing. The preliminary treatment, as indicated in the previous article in this series, consists ordinarily in hand picking, discarding foreign pieces, and removal of attachments of other metals, wood, etc. Utensils are best baled before melting. Foil scrap should be baled.

POURING PRACTICE.

After the furnace operation, the recovered metal or alloy is poured into pigs or small notch bars. The usual large pig weighs about 30 lbs., and the small notch bar 3 to 8 lbs. Metal is usually poured by hand from carrying ladles or crucibles or from bull ladles suspended from chain hoists. Pig molds are made of cast iron. These may be placed on the floor in rows, or mounted in a row on an I-beam structure so that the row can be turned upside down and the pigs dumped out after cooling. Water-cooled molds have been used. Production methods for the pouring of pigs in secondary aluminum work have so far been poorly worked out, and present standard practice can be greatly improved.

The blending of miscellaneous lots of scrap is essential in the production of merchantable metal, and control of composition is very important. The eighth article in this series will deal with blending methods in secondary aluminum smelting.

International Foundry Congress

The International Foundry Congress was held in Paris, France, September 12-16, 1927. Some of the principal papers on metals are given below in abstract.

The Influence of Alumina on the Casting of Aluminum

By M. F. RENAUD

Melted aluminum is covered by a thin film of alumina upon exposure to air. This sheath has a high surface tension and lowers the fluidity of the melt. The author suggests, to eliminate this alumina, the "change of direction" process of pouring, or perhaps filtering. He does not favor the "decanting" process.

Study of Metals and Non-Ferrous Alloys and Their Uses in the Foundry

By A. PORTEVIN

For non-ferrous alloys there is little difference between macrography and micrography. The author studies the methods of interpretating the solidification structure of metals, pointing out that the size of grains must be considered and also the shape and direction.

Factors which affect crystallization and the structure of metal castings are as follows: (1) agitating the melt; (2) rate of cooling; (3) nature of the alloy.

A Few Properties of Special Brass with Manganese Nickel

By M. LE THOMAS

The author describes work on special brass with the addition of 5 per cent nickel and 3 per cent manganese, the brass being of the proportion 59-41 copper-zinc.

This brass shows very little variation in breaking load and elongation with variation in temperature. On the other hand, the Brinell hardness falls as the temperature rises. The melting temperature is about 885° C., shrinkage about 1.13 per cent. The corrosion resistence is high.

Electric Furnace Melting of Copper Alloys

By R. LEMOINE

The author recommends arc furnaces and induction furnaces using low frequency current. The choice of furnace depends upon the alloy in question. He recommends also that every foundry should investigate the possibilities of using electric furnaces as in many cases they could be installed to advantage.

Casting Britannia

Q.—We are calling on you for assistance for troubles that we can not overcome. We have a brass casting for soft metal (shoe ornament). The details of the design are very fine and the casting does not fill in properly. We have done already many molds for coffin trimmings and plated ware ornaments and every one was O. K.

The sample is more tough to bending and scratching than the alloy generally used for this purpose. The color is aluminum-like. Is it a deposit of the natural color of the metal?

A.—You state the casting does not fill in properly. This can be caused by the air not getting out of your mold or by not using the proper mixture or the proper gates.

The sample is evidently Britannia metal, high in tin and looks O. K. to us. We would think it runs approximately 80 to 90 tin and 10 to 20 antimony. If this mixture does not run sharp enough, add 2% bismuth. This mixture should be satisfactory. To obtain clear and fine castings of Britannia metal it is best to use a brass mold. Before casting, the mold should be heated and coated with a mixture of lamp black and oil of turpentine or smoked with a lamp filled with oil of turpentine.—W. J. REARDON.

Tempering Taps

Q.—What is the best method to follow in hardening or tempering high-speed steel taps in a forge? We have no heat treating furnaces.

A.—While a regular furnace is better in every way high-speed taps and other tools can be heated and hardened in a good forge.

A few pieces of 4 and 6 inch channel iron about a foot long, some good gas coke, a barrel of water and some good quenching oil with a wire basket that can be easily lifted out of the tank, completes the outfit. High speed taps are difficult to harden because of the chance of blistering. Put a piece of the channel iron in the fire, bank the fire around it and cover with a plate. Use this as a muffle to preheat the taps. Then make a hole in the fire under the channel iron and shut off the blast. Place the tap in the recess which is a small retort, then heat it to a yellow heat quickly and quench in oil at the desired temperature.—P. W. BLAIR.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 13

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

CORRECT RAMMING OF A MOLD

As previously stated, the reaction of a sand surface to the action of metal falling, flowing or lying against that surface must be absorbed or the metal will not lie or set placidly. Since the cushion-like condition is the principle of absorption, any properly rammed mold will therefore incorporate a rigid, unyielding background mass of sand terminating in a soft, unglazed casting surface of the mold. To so construct a mold as to realize this hard, unyielding background mass and still retain the soft unglazed surface is the secret of correct ramming.

First of all the sand must be right and above all not too wet since wet sand not only hardens and glazes more

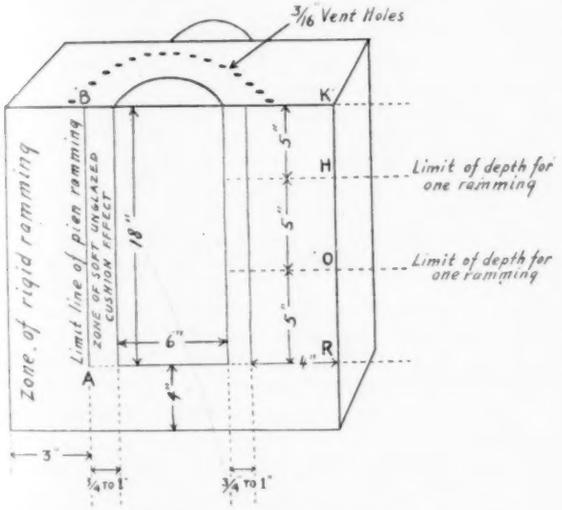


FIG. 49. PATTERN FOR BRASS PIN

under the rammer but also allies greater steam or gaseous pressure with reaction. The next consideration is the position of the pattern. It should not lie in hampered quarters where correct ramming is practically impossible to attain. Almost any pattern lying too close a flask wall will have its surrounding sand, if at all tamped, too rigid throughout for safe practice. There simply is not room to manipulate the surface cushion of sand. This condition shows up principally in those molds of greater depth, yet whether the mold be shallow or deep, overcrowding the flask is one of the attractive evils of the day and one of the generous sources to which foundry scrap, in one way or another, can be traced. The run-out, the scab, the kick, the crush, the wash-away, the buckle, etc., are among its many possibilities, when the pattern lies too far from the flask wall and especially in deep work, the sum total of yield in the sand wall is liable to result in a casting of over-dimensions. Shallow drags and copes are further evils in this connection. Any molder knows that a heavy casting having two or three inches of sand between its bottom and the bottom board will often scab regardless of care in tamping which would not scab with from four to five inches of sand underlying it. He knows, too, that many a cope of certain height will drop out or cause a shrink in the casting that a few more inches of height would obviate.

In the actual tamping of sand and the manipulation of the rammer, lie the further factors of correctness. First of all the degree of hardness or softness must be in keeping with the demands of the metal at different mold points or sections and the tampering sectionally uniform. It dare not have localized soft and hard spots in the same zone. The subject will be best considered under the heads of deep molds and shallow molds and will be studied in this order as per figures 49 and 50. The fundamental principle is **"Never ram hard or sharp against the pattern."** Fig. 49 represents a pin brass pattern 18 inches long by 6 inches diameter. It is made in a rigid flask 14 inches square by 22 inches deep and is consequently surrounded by 4 inches of sand depth. The bottom surface of the mold must be rigid up to within an inch of the pattern, and from there on soft and cushion-like. Such castings are best made in a three part flask, the drag being 4 inches deep. In ramming this drag, correct practice is to lay it on a level follow board, fill heaping full with sand, peen-ram hard around the flask edges, add more sand, "tamp" and butt ram hard, strike off, fit bottom board, close and roll over. The reverse practice of ramming this drag up on a bottom board with pin holes up and then striking off level is bad in that the hard and glaze of the rammer is directly under the pattern and constitutes the very mold surface we do not want. The pattern is then set in the center of this drag and the mold filled to five or six inches depth.

One of the mistakes of deep-mold tamping is the attempt to ram too great depth of sand at one time. Neither uniformity nor correctness can be attained by it. From the edge of the flask the sand should then be peened hard and rigid inward to dotted line A B or from ¾ of an inch to 1 inch away from the pattern. This peening should be done with a peen neither too sharp nor too blunt (½ to ⅝ inch ramming face) and should represent a repeated number of medium hard strokes of the rammer. Following, the sand should be butt-rammed hard up to line A B then butt-rammed lightly from this line up to the pattern. The

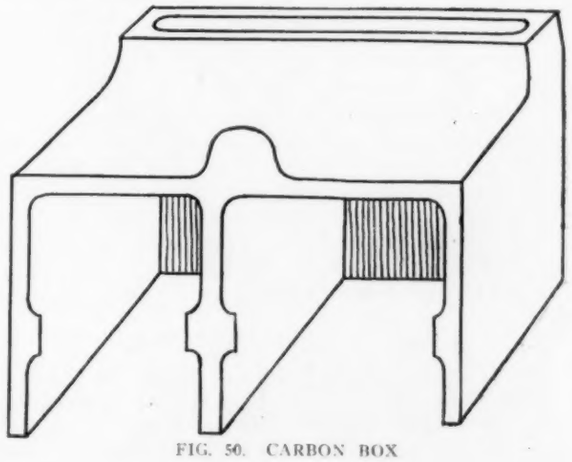


FIG. 50. CARBON BOX

*All rights reserved. This series will be collected and published in book form. Parts 1 to 12, inclusive, were published in our issues of July, August, September, October, November, 1926, January, February, March, April, May, August and September, 1927.

surface of the sand should then be scratched or roughened to insure union with the next filling of sand and the process thus repeated up to within about 4 inches from the top of the pattern when the hardness of tamping should ease off gradually from there to the top of the pattern. In this upper zone the metal pressure is much less than farther down and the casting will shrink inward from the wall if the wall be too hard. Shortly back of this A B parting line 3/16 inch or ¼ inch vent holes should be made around the mold and to the bottom of the pattern. With the proper grade of sand properly manipulated by the foregoing principles, and further protected against the burning of metal by a dry talc or plumbago facing rubbed on, this mold will produce in green sand, a smooth solid casting free from cutting, scabbing, swelling or serious sand burning. In entering this mold the metal engages a soft cushion-like surface which yields slightly to absorb action and reaction, while the gases from this surface readily find their created mediums of exit and leave the metal undisturbed. Incidentally the mold should be poured from the bottom with fairly hot metal and the feeding of the casting taken care of by ample cope height and volume of metal. The green sand compound facing previously referred to is a further guarantee toward the mold safety and efficiency.

In the more shallow pattern Fig. 50 can be taken to illustrate. It represents the middle cross section of a carbon box and a case of particular ramming. The green sand core in the body must be firm to obviate any swelling whatever. But a hard ram will not be tolerated by the metal in this part of the mold. To get the desired effect there should be at least 1½ inches sand under the lowermost bottom pattern part. The sand should not be too close of grain and by all means well tempered and on the dry side. Fill the flask level full, "sock" the flask down to get a full ramming effect to settle the sand, peen around the edges, refill flask heaping, jolt and butt-ram hard over the entire surface. Follow by "striking off," venting freely with a fine vent wire and fitting a bottom board evenly. This gives a firm rigid green core and obviates the hard ram close the pattern. Incidentally this hard close ram over any pattern surface is contradictory to principle and the source of many defective castings.

In tamping a mold, three distinct methods are mainly in use, compression, impact, and jolt or jar by which the sand settles and packs particle against particle. Compression includes ordinary hand ramming and the machine for that type of ramming is known as the "Squeezer." Impact ramming is identified with both the "throwing" and "whipping" of sand into the mold either by hand or by machine.

The gravity machine which drops sand from a height and the "Sand Slinger" which mechanically paddles it into the mold are examples. Jolt or jar is accomplished by bumping the filled mold vertically up and down to settle and pack the sand, and is done mainly by machine known as "The Jar," "The Jolt" or "The Bumper." Analysis of these principles will show what practice proves, that greatest danger and consequently greatest care and skill are attached to compression, in that the squashing effect of ram or squeezer will glaze and at the same time smash the sand grains to finer particles and closer body jolt ramming merely packs the grains close against each other and escapes the squash. Molds can be rammed firm and unyielding by it with less danger of cutting and scabbing.

GASES AND GASEOUS PRESSURES

A gas is defined as that state of matter in which the molecules repel each other. In foundries, gases differ chiefly from liquids in two details. First, the gas will compress, the liquid will not; second, escaping from compression the gas expands suddenly, the liquid does not. The gas, in short, has an expansive force peculiar to itself.

MOLD GASES AND THEIR ORIGIN

Mold gases are generally a consequence of heat. They are generated from the heat action on the moisture and the vegetable matter in the sand and expand with the degree of heat supplied. The atmosphere or air we breathe is a gas which at sea level has a normal pressure of 14.7 pounds per square inch. When heated the atmosphere expands and the pressure rises. The intensity of this pressure in a mold can be noted in the cope vent of a hard-poured casting as the gases escape violently through it, and represents the pressure of a liquid contesting that of an expanding and hampering gas. Fundamentally, two forces oppose the liquid, the resistance of the atmosphere at normal pressure to displacement and compression, and the expansive force supplied by the heat of the metal in the mold.

When for any reason these forces exceed the liquid pressure or the metal density, the casting suffers some consequence of that excess. The buckling of surface sand in a mold, the misrunning of castings from pocketing gas, the rising up to and receding of metal from a mold surface, the entrapped bubble in a casting, the crack and jar of explosion at pouring finish, the "quivering set" of metal exhibited by the casting, ect., are all possible indications of this condition of excess. In a mold gases follow the general law and seek freedom along lines of least resistance. When through the sand to the vent to the atmosphere, the gases go harmlessly that way. If not, they turn against the metal and damage results.

Briefly, the priciples of gaseous activity in molding are:

1. Gases are generated from heat and vary up or down with it.
2. Gases can be compressed and increase their units of pressure with compression.
3. Gases vary with the nature of sand, with its moisture and volatile matter.
4. Gases vary with volumes of metal and with surfaces of exposure.
5. Gases seek freedom along the lines of least resistance.

From these simple princip'es safe molding against gases reduces to the common sense of holding these gases to a minimum and according this minimum free and unhampered escape to the atmosphere. By fluid pressure no core was ever blown, no mold sand ever disturbed but for metal that in some way or other did not generate more gas than the sand would freely carry away. Again the nature, grade and condition of sand jumps into prominence; its openness or permeability; its bond, natural or supplied; its power to resist heat and mechanical action; its wetness or dryness; its rammed compactness; its volatile matter, its mechanical venting, etc., are all important. The permeability of sand ought to be in keeping with the nature of the metal and the nature of the casting. Average brass, for instance, will mold in a closer sand than could be safely used for iron or steel because the latter represent a higher temperature and a consequent greater volume and pressure of gases; likewise different alloys of different fusion as Monel metal compared to the 88-10-2 alloy; similarly the size, shape and bulk of castings. Any molder knows that a broad expansive mold surface will scab and blister unless care and pains are taken regarding the grade of sand, its condition and its tamping. Its gaseous volumes and pressures simply increase with its surface of exposure on the same principle that a quart of water on a stove in a dish pan will steam quicker and harder than the same volume of water in a tomato can.

This series will be continued in an early issue.—Ed.

New Chromium Plating Plant

National Chromium Corporation's Plant Illustrates Chemical Engineering Applied to Electroplating

Written for The Metal Industry by LOUIS WEISBERG and WILLARD F. GREENWALD, Consulting Engineers

The chromium plating plant to be described was installed for the National Chromium Corporation of New York. The National Chromium Corporation is engaged in chromium plating for manufacturers and other large users who do not have their own production facilities. Its policy is to accept work only on contract or where large runs are involved. Consequently, in designing the plant, it has been necessary to aim at the maximum efficiency of operation, to permit prompt service to customers and the lowest possible operating costs.

Very little attention is usually paid in the ordinary job plating shop to the design or location of equipment. Tanks and generators are placed wherever space can be found, while pipes, wiring, and bus go in all directions. The shop is poorly lighted, in most cases, and little provision is made for effective ventilation. No thought is given to routing the work through the plant in an efficient manner. Under these conditions, the workmen cannot turn out the highest grade work at minimum cost.

In this plant, the attempt has been made to embody the best modern practice in shop layout. The plant is located on the tenth floor of the Graphic Arts Centre Building at 200 Varick Street, New York City. This floor comprises a total of 35,000 square feet, all of which has been reserved for National Chromium Corporation. The building is open on all sides; so the entire space is exceptionally well lighted.

The first unit, which is now completed, occupies approximately 8,000 square feet. In laying out this unit, the purpose was to make it flexible so as to handle a wide variety of work. Subsequent units will be designed for specific classes of work.

SEQUENCE OF OPERATIONS.

The usual sequence of operations is shown in the flow sheet, Figure 1. The work enters the plant through the receiving department, where it is unpacked, checked, marked for identification, and disassembled when necessary. Here the order sheet, with complete instructions, is attached. If the work requires polishing, it goes through the polishing room; otherwise it goes directly to the plating room. The first operation in the plating room, irrespective of subsequent operations, is the removal of all dirt and grease in the cleaning tanks. After cleaning, the work is thoroughly washed in running water and goes then through either an acid or a cyanide dip, or both. After another thorough washing in water, the work is ready to be plated. For some purposes, an undercoat of copper or nickel is applied, and where a high finish is desired, the nickel or copper is colored and cleaned again.

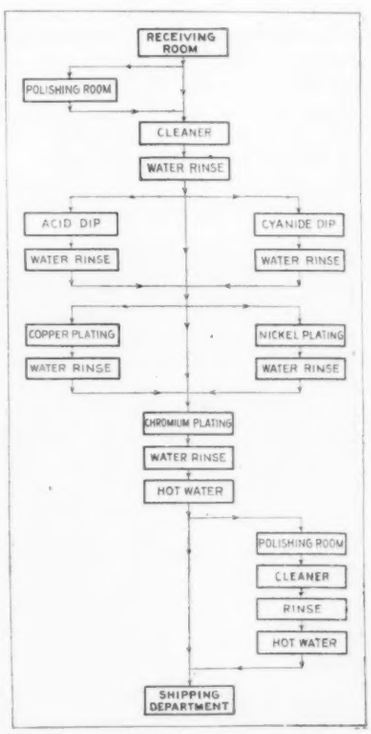


FIG. 1. FLOW SHEET OF PLANT

The work then is chromium plated. After chromium plating, it passes through several water rinses to remove all the adhering plating solution and finally through hot water to facilitate drying. In some instances, the work requires coloring and is returned to the polishing room, after which it is cleaned and dried. It is then sent to the shipping department, where it is assembled, inspected, counted, checked with the receiving slip and packed for shipment.

A comparison of the flow sheet and floor plan (Fig. 2) will show that the plant is laid out to handle the sequence of operations described above with a minimum of lost motion.

DETAILS OF CONSTRUCTION.

As the floor in this building is of concrete and ungraded, it was necessary to lay an acid and water resistant floor in the plating room. This floor is separated from the main concrete floor by a divorcing membrane of building paper, over which is laid a double layer of tar paper. A layer of ashes and cement graded to the drains over the tar paper is followed by a surfacing of concrete. On top of this was put four ply of tar paper swabbed with pitch. Acid proof, vitrified brick was then laid in sand and hot asphalt poured between the bricks.

The tanks for washing are made of 2-inch cypress. Three inch cypress asphaltum lined, is used for the acid dip and nickel tanks. The cleaning tanks, cyanide and copper plating tanks are made of welded steel. The chromium plating tanks are made of welded steel and are lined with 8 lb. lead. All tanks which require heating, with the exception of the chromium plating tanks, are fitted with ordinary iron pipe coils. In the chromium tanks, antimony lead coils are used.

The tanks are levelled and set a minimum of four inches above the floor, the tops of all tanks being at the same height. The tanks are raised from the floor to permit air circulation under them so as to prevent rotting or rusting.

With the exception of steam pipes, all piping is run four inches above the brick floor. The water pipes are carried over the sides of the tanks and valves placed at convenient points for operation. The piping from the tank outlets is carried to points directly over the drains. The steam piping is placed over head to prevent water pockets and is lagged throughout its length. Steam exhaust from all coils, with the exception of those in the chromium plating tanks, is carried to the hot water tanks.

The entire plating room is covered with a level duckboard floor, 30 inches below the top of the tanks. This floor covers all the piping and wiring and places the operators at a convenient working height. At the same time, it provides a dry floor on which to stand.

Steam for this unit is generated by two 10 horse power gas fired boilers, provided with automatic pressure control, water feed, and low water gas cut-off. The makeup

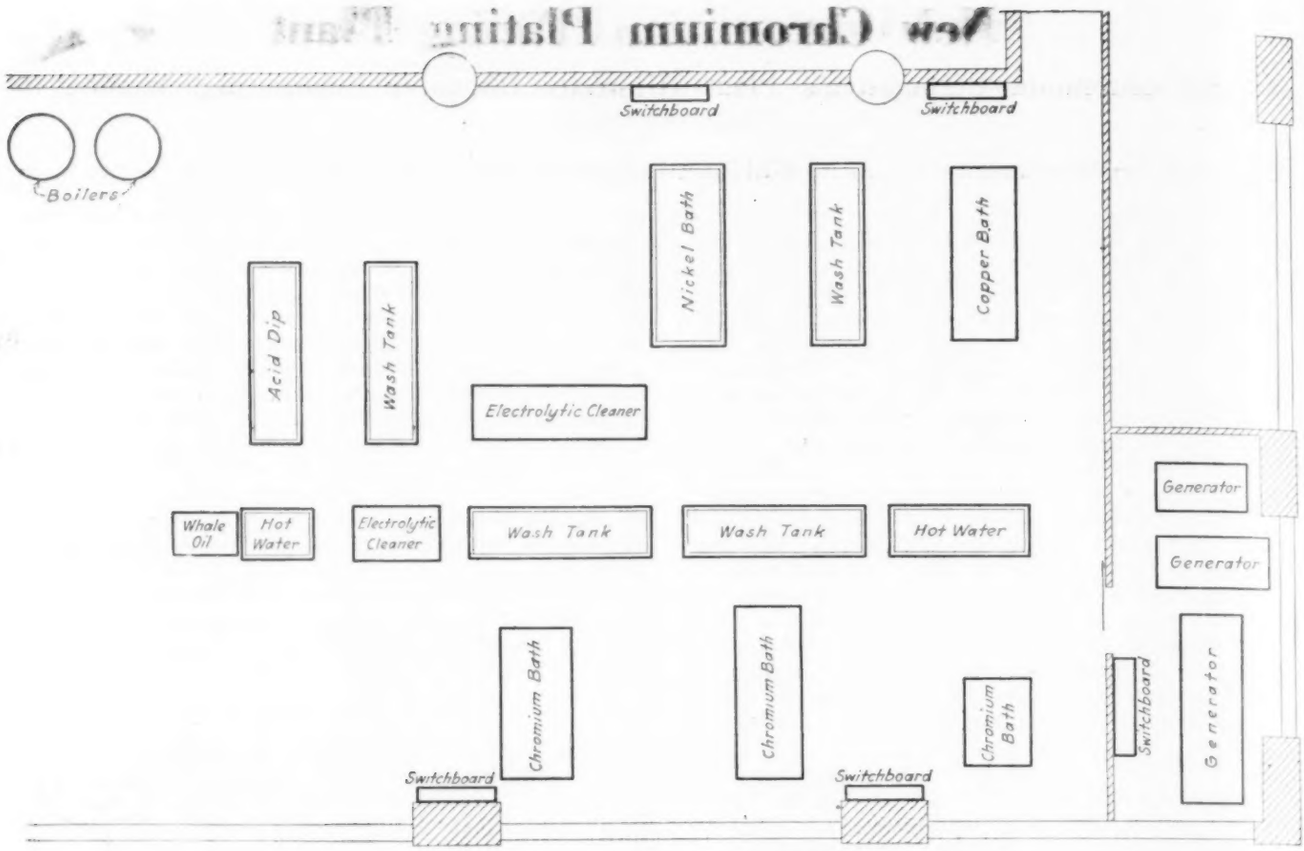


FIG. 2. FLOOR PLAN OF PLANT

water for the boilers is drawn from the hot water supply of the building.

As the spray and fumes from the chromium plating tanks are deleterious to health, ample provision is made for removing them by means of ducts running along the sides of the tanks and connected to a common blower system. These fumes are carried above the roof by a duct on the outside of the building. The use of ducts placed along the sides of the tanks not only provide effective ventilation but keep the space over the tanks clear of obstructions.

Hoods placed on the ceiling remove steam from the hot water and cleaning tanks.

ELECTRICAL EQUIPMENT.

The generators are placed in a separate room to protect them from acid fumes and dampness. The generators are so installed that each one can be connected to any one of the chromium plating tanks. This is accomplished at a switchboard placed within a few feet of the chromium plating tanks. All meters are also placed on this board. No rheostats are used in the low voltage circuits, the voltage on the tanks being controlled by means of rheostats in the generator fields. These rheostats likewise are placed on the control board.

A separate generator is provided to take care of the nickel and copper plating tanks and small chromium work.

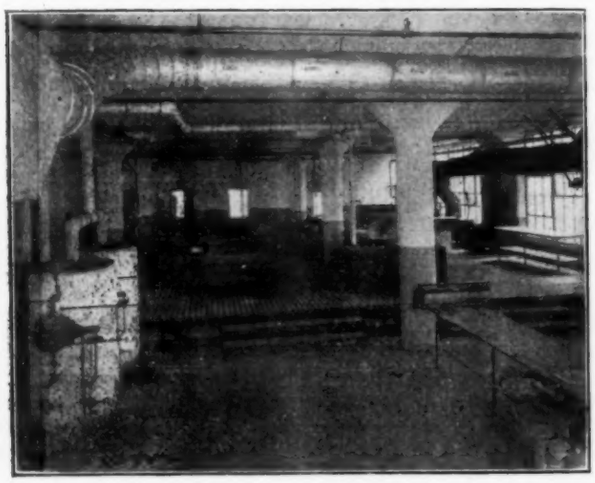


FIG. 3. VIEW OF FIRST PLATING UNIT

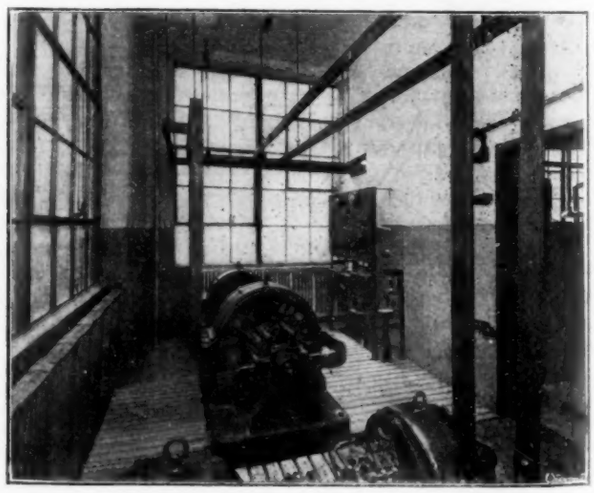


FIG. 4. VIEW OF GENERATOR ROOM

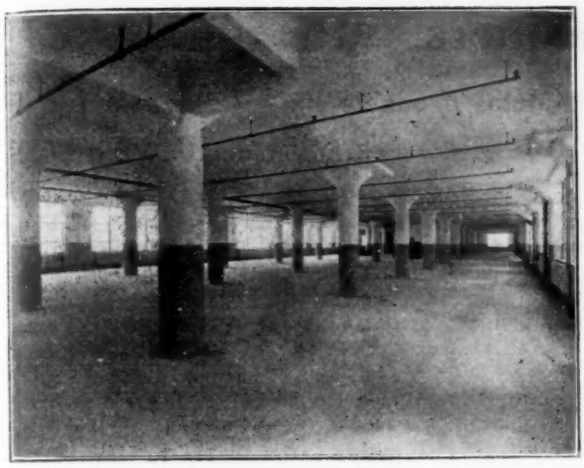


FIG. 5. VIEW OF FLOOR BEFORE INSTALLATION

The generators are double commutator machines, delivering either 6 or 12 volts. They are mounted on iron sub-bases direct connected to the driving motors by means of flexible couplings, shunt wound, interpole type, and separately excited from the 220 volt direct current in the building. Switches and starting rheostats are mounted on a panel in the generator room, but the generators may also be stopped by remote control at the switch board in the plating room.

All bus work is built up from copper bars, 3″ x ¼″.

Individual motor driven polishing lathes are used in the polishing room, and a separate ventilating system is provided to take care of the dust from the polishing wheels. This system has been liberally designed to take care of additional polishing lathes whenever these are installed.

A machine shop has been provided to handle repair work in the plant and build special equipment that is required for efficient chromium plating. All machines are provided with individual motor drive.

The Revere Copper Company

By R. F. HAMILL

Paul Revere, known to every good American as the patriot who saved our country by his midnight ride, is interesting in his relation to early American industry. A goldsmith and silversmith of no small artistry, Revere produced beakers, tankards, teapots, and flatware that are today prized by collectors. He taught himself the art of copper-plate engraving, and just before the Revolution was producing all sorts of engraving, from songs to paper money. He was also a dentist in his spare moments, making gold teeth and plates for the unfortunate Bostonese who had lost their own molars.

After the Revolution Revere established a brass foundry at Canton, Massachusetts, and with one of his sons as a partner formed the Revere Copper Company. Their advertisement read as follows:

"Paul Revere and Son at their Bell and Cannon Foundry at the North part of Boston Cast Bells and Brass Cannon of all Sizes and all kinds of Composition Work. Manufacture Sheets, Bolts, Spikes, Nails, etc., from Malleable Copper and Cold Rolled. N. B. Cash for Old Brass and Copper."

From this establishment came much of the metal work for early machinery and experimental work in this country. His company supplied bolts, spikes, and other metal parts for the famous "Old Ironsides"; and the copper sheets for two of the boilers for Fulton's early steamboats came from the factory of the Revere Copper Company.

The Revere Copper Company must have had extensive plans for their future, if we are to judge from an interesting petition which they sent to Congress. On January 21, 1908, their petition, which had been referred to the Committee of Commerce and Manufactures, was taken up in the House of Representatives. The report, as presented by Representative Newton of Virginia, gives the petition as follows:

"The petitioners (Paul and Joseph W. Revere) state that they have, by great application, acquired the knowledge of melting and refining copper ores, and of manufacturing copper into sheets, bolts, nails, etc., for fastening ships; and that they have, at a great expense, erected furnaces, mills, and other works, for manufacturing the above articles. To encourage them, they solicit that a duty of 17½ per centum ad valorem may be imposed on copper in sheets, as they have no doubt that they can supply the whole quantity at present imported into the United States. They likewise solicit that old copper may, in future, be imported free from duty."

Mr. Newton reported that the committee had carefully considered the petition of the Reveres, and had determined that the first clause of the petition should not be granted. In the first place, the committee felt that there was no proof that the Revere Company could produce all the sheet copper likely to be used in the United States. In the second place, "the committee being aware that a manufactory, single and without competition, is apt, by having the command of the market, to make an improper use of it, are solicitous to keep the sources of supply as open and as free as possible." Their second request was granted the Revere Copper Company, but the House refused to grant the 17½ per cent duty.

Bright Aluminum Dip

Q.—What is a good bright dip for aluminum?

A.—A good bright dip for aluminum can be operated as follows. Dip the parts in a potash solution until they are clean of oil, grease, etc. Remove before they become too dark, then dip in an acid solution until the dark color is removed.

The acid solution of nitric acid 2 gallons; sulphuric acid 1 gallon. Drain the articles thoroughly after acid dipping then wash in cold and boiling water and dry out in maple wood sawdust.—JOSEPH HAAS.

Stripping White Gold

Q.—Will you kindly let me have a recipe for making a stripping solution for white gold, which will give the metal a nice bright finish?

A.—Sodium cyanide, 4-6 ozs. per gallon and the articles used as the anode is the only method we know of that will leave white gold metal bright; but not so bright, however, that buffing or coloring can be eliminated.—JOSEPH HAAS.

Metal Lacquers

Lacquers for Various Metal Products

Written for The Metal Industry by Prof. H. C. WHITE, Dept. of Chemical Engineering University of Maine

The principal ingredients in metal lacquers are soluble nitrocellulose and gums, in a suitable solvent mixture.

Their most important applications are (1) as a protective coating, for example, on silver, to prevent tarnishing, and not designed to remain on the metal after it is in use, and 2) as a semi-permanent finish, either alone or combined with bronze powder or color.

For either class of application the first essential is a surface absolutely free from grease, water, or plating solution. The usual treatment of the piece to be lacquered is to immense in soda ash solution and then dry in hot sawdust. In addition, a dip in benzene, or some similar solvent is often used just before the lacquer is applied, so that the last traces of grease and water will be removed. In cases where reliable lacquers show poor adhesion, the cleaning processes should be immediately checked up.

To avoid unnecessary exposure of the freshly cleaned surfaces to the air, the metal articles should be taken from the cleaning department to the lacquering department immediately. The method used may be either spraying or dipping. Where the spray is used it is usual to arrange small articles in a tray, which is placed on a turntable, and revolved by the operator while he rapidly applies the coating. Every factory has its own dipping method, most of which are mechanical. In late years spraying has displaced dipping methods to a large extent, except in the case of a few types of articles.

About one hour after lacquering the material can be handled with comparative safety, and may be packed at this time if absolutely necessary. However, it is better to allow three or four hours, so that the film may become thoroughly hard.

SILVER LACQUERS.

Nearly all silver articles are lacquered after plating to prevent the formation of silver sulphide on the surface. Even tableware is treated, but in this case the coating is designed to remain only while in the hands of the jeweler. The qualities to be sought in a tableware lasquer are light color, and the ability to be applied smoothly. Adhesion and wearing qualities are of little importance. The usual lacquer is one containing no gum, since a gum always tends to darken a lacquer, and is used only when good adhesion is important. The nitrocellulose used is called water white, and may be prepared by bleaching ordinary nitrocellulose with bleaching powder, or by nitrating certain grades of material.

Where slightly better adhesion is necessary, as in the coating of silver chandeliers, a small amount of dammar gum is added, since this does not greatly affect the color.

Silverware is usually given only one light spray coat of lacquer.

In purchasing silver lacquer, the following qualities should be considered: (1) Lightness of Color (2) Color after spraying (3) Freedom from specks (4) Freedom from blushing during spraying.

BRASS LACQUERS.

This is by far the most important class of metal lacquers. All builder's hardware, electrical fixtures, gas fixtures, and similar articles are lacquered, either to prevent tarnishing, or to improve their appearance. Many large manufacturing concerns produce their own lacquers, after buying the proper grade of nitrocellulose and other ingredients from the large producers of these materials. The usual method of application is spraying, and one coat is usually sufficient. A thin coating applied to the metal possesses far better adhesion and durability than a thick coating, although one might think the reverse to be true. This type of lacquer always contains gums.

The qualities to be looked for in brass lacquers are: (1) Color (2) Freedom from Specks (3) Color after spraying (4) Adhesion (5) Flexibility (6) Freedom from blushing.

In addition to the above classes of lacquers there are many for special uses, such as those designed to give special finishes, those for mixing with bronze or aluminum powder to duplicate gold, brass, or silver on a cheaper metal, and those colored with aninne dyes to give metals various shades. All of the last mentioned are relatively unimportant from the electroplating standpoint.

Water Dip lacquer is a preparation of the cheaper gums in a cheap solvent mixture, and has the advantage that articles may be taken directly from the electroplating bath, washed in water, and placed in a tumbling barrel with the lacquer without drying. The coating is only suitable for very cheap materials such as buttons or glove-fasteners.

QUALITIES OF LACQUERS.

In purchasing lacquers it is necessary to understand the qualities other than price which govern the merit of the material. It is quite often one of the duties of the electroplater to decide upon the choice of coating material, and an understanding of what to look for is of value. Nearly all lacquers must be thinned with a suitable solvent-mixture before their viscosity is sufficiently low to be handled by the spray gun. Users are frequently misled by viscosity, which does not necessarily mean that the solid content is high, and that when thinned to a proper degree a film of satisfactory thickness will be deposited. The nitrocellulose may be of a variety which will produce a highly viscous solution without much of it being dissolved, and a lacquer made with a cotton of this sort may contain a very small amount of solids per gallon, and yet be so viscous as to look extremely concentrated. Naturally such a lacquer, when diluted to spraying consistency, will deposit a film which is entirely too thin. In addition the buyer is paying for lacquer and only getting solvent. It is therefore well to evaporate 100 cc. of the material to dryness in a weighed aluminum dish and determine exactly the number of ounces per gallon of solids.

If it is necessary to determine the nitrocotton per gram ratio, the dried mass may be tested for nitrogen by the Kjeldahl method, on the assumption that all nitrogen will come from the nitrocotton, which on the average contains about twelve per cent nitrogen.

The tests which determine the physical characteristics of the film are largely dependent on judgement and experience. The most convenient method is to spray or dip thin flexible strips of the metal to be lacquered. These strips may be bent and twisted to decide on the relative flexibility, scratched with the thumb nail to determine hardness and adhesion, and preserved to show whether or not the lacquer discolors the metal.

Japanning Automobile Products

How This Work Is Done in the Plant of The Motor Products Corporation, Detroit, Mich.

By J. B. NEALEY

The automobile has probably done more to advance the metal finishing industry than any other one factor. The automobile manufacturer, in trying to satisfy the demand for increasingly better cars, requires every type of finish known, and is constantly at work to devise novel finishes or to decrease the cost of standard finishes.

The old art of japanning has practically been revolutionized as is evidenced by the work which passes through any of the larger plants engaged in this business today.

One of the leaders in this work is the Motor Products Corporation of Detroit, Mich., which specializes in contract work for the automotive industry. A vast multitude of parts ranging from Ford oil tubes to Packard window frames is constantly flowing through this enormous plant.

The extremely large variety of coating materials required in the production of these thousands of parts, large and small, has introduced a great many problems.

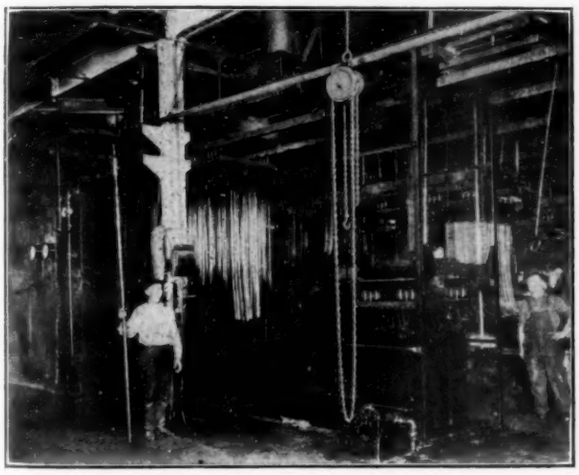


FIG. 1. STRIP JAPANNING, SHOWING BATTERY OF OVENS, CONVEYOR SYSTEM AND DIP TANKS

New methods or revised and improved equipment are the only means by which these problems could ever have been solved.

BLACK ENAMEL AND JAPAN

Consider some of the features of the department handling solid colors, usually black enamel. Here are finished, such articles as snap-on molding, body slip cleats, and others used in the less expensive cars.

The article to be finished is suspended by a fine wire from the carrier or rack, which trave's on over-head tracks. These carriers are provided with a number of cross bars on which are hung the hooks for the wire holders. Each rack has a capacity of between 180 and 456 strips of molding, depending on the design of the strips. These are loaded, unloaded, and transferred by two girls.

A rack, having been loaded, it is first run through a washing vat, then into a rinsing vat and then the work is dried. The japan or enamel is applied usually by dipping, after which the rack, with its load goes, into the baking oven. Additional coats of finish are put on in the same way, care being taken not to have the load exposed to factory dust during cooling between bakes.

The over-head trolley system, is modern in every respect, with through tracks, transfer panels and switches, which makes it easy and convenient to take a rack out of the line of production, or re-route it at will.

The cleaning solution is specially prepared and maintained at a temperature of about 212° F. Both the dipping tank and the rinsing tank are about three feet square and ten feet deep, with the fluid surface at about floor level. They are both steam-heated.

A carrier loaded with molding coming out of the rinsing tank dries very quickly, due to the heat absorbed by the metal while in the tank. Very thin molding or parts having very little metal content are run into a drying oven after rinsing, in order to speed up this operation. All parts are thoroughly dried before going into the japan tank.

There are five Young Brothers ovens in two batteries, three in one, and two in the other, that serve this department. These are two compartment, indirect gas-fired ovens, equipped with mechanical ventilation and automatic temperature control. The fresh air is fed from the rear of the oven. An independently piped pilot flame, insures immediate ignition in case the flow of the main gas line is temporarily broken. The baking time varies, of course, with the type of work and finish, but ordinarily runs about 45 minutes at 450° F.

In addition to these ovens we find one of the Young Brothers continuous conveyor-type ovens, designed for mechanical ventilation and operating from a remote oil heater. The baking period and temperature for this oven is the same as for the two batteries of rack-type ovens previously mentioned. Practically all types of sheet metal parts are being baked in this continuous conveyor type oven.

WOOD GRAINING FINISHING.

Wood graining on metal has reached a state of perfection that is truly remarkable. The likeness to a highly polished wood surface is so exact that even an expert could not tell the difference without a mechanical test. Wood graining, unlike black japaning, requires a great deal of expert hand work, and it is very hard indeed to keep the ranks of experienced operators recruited. Both

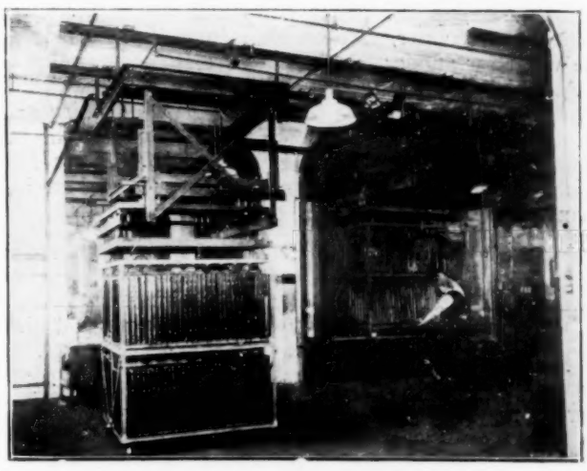


FIG. 2. OVEN INTERIOR AND LOAD READY TO GO IN

men and women are to be found handling this type of work.

The wood graining process consists first of placing a flat ground coat on the article. On this is superimposed the graining coat, and on top of that from one to five varnish coats.

SPRAYING.

The ground coat is applied by means of a spray gun operating under one hundred pounds air pressure. Originally it was attempted to apply this coat by the dipping method, but it was found that dipping was sure to cause runs and other imperfections, which could not be economically rectified in the later stages of the process. The air pressure on the guns is maintained uniform in order to secure the best results. This is accomplished by an auxiliary air reservoir or receiver at each booth.

The spraying is done in the standard spray booth equipped with the usual exhauster to the outside air. In order to separate the fine particles of paint from the air leaving the booth, a separator is installed in the line of flow. This separator is merely a series of baffles arranged perpendicularly and staggered in three banks. The paint on striking these baffles, is collected and runs down into a collecting trough. About one gallon of paint is gathered in this trough during an eight-hour working day.

The ground coat having been baked on, the parts pass on to the graining benches. The process of graining, except on large flat surfaces, is done with a cheese cloth swab and brush, by hand operators. After the graining coat has been baked on, the finish coats are applied, each one being rubbed separately with oil and pumice.

On large flat surfaces, such as instrument boards, the graining is done in a cylinder press, using rubber printing rolls. The finish coats and ground coats are applied in the same manner as described above for irregularly-shaped parts.

Throughout this department, as in the finishing department, parts are conveyed from one process to another, and into the ovens by an over-head trolley system. When a rack load of material is ready to be baked, it is pushed over to the oven loading station, elevated by compressed air to oven door elevation, and run into the oven.

OVENS.

Easily the most important equipment in the graining department is the baking oven. The oven installation under discussion consists of four batteries of two double ovens, each indirect gas-fired, using three longitudinal burners, extending throughout the oven length. The Selas system of premixing gas and air is giving excellent results in this installation. City gas is the fuel used. Usually it is necessary to use only one of the burners after the oven has been brought up to working temperature. The three burners are used when starting an oven, or when especially high temperatures are desired. A Brown recording thermometer and a Robertshaw control, which operates directly on the burner by-pass valve, make the installation practically automatic.

The baking time for the standard charge varies from one hour at 300°F. to between two and one-half hours and seven hours at 200°F. The variation in temperature is due to the variation in the basic chemicals in the finish.

VENTILATION.

Probably no other factor in oven design is more important in this type of work than scientifically balanced ventilation. On it depend the proper hardening or baking of the finish rather than a mere drying of it. Ventilation must effectively equalize temperatures in all parts of the oven to insure uniform baking on all parts of the same piece and on pieces of the same charge. Ventilation must carry away all volatile gases given off by the finish when brought up to baking temperature. These results are obtained in this by three registers supplying fresh air and located at each end of the oven. A duct on the oven door opens at the bottom of the oven to conduct the heavier vapors to the main exhaust outlet. The lighter gases are drawn off through a duct at the top.

Uniformity of heat throughout the oven, efficient ventilation and flexibility of temperature control, are in large measure responsible for the high rate of first quality product turned out.

Stripping Copper

Q.—We are using cyanide copper plating for localizing heat treatment. After the heat treatment the copper must be removed. Can you tell me the best method for removing same. I am taking it off now in a hot cyanide solution with reverse current, but it seems that there ought to be a faster way. We plate for one hour and get about .003″ deposit. Then it takes a day of 9 hours to remove the copper. The tank is used for cathode and the work for anode; 6 volts pressure is used.

A.—If your work is of such nature that it will stand tumbling, then tumbling for 3 hours with pumice stone water to which sodium cyanide has been added, this will remove the copper plate. If your work will not stand tumbling then your present method is the best there is.—Joseph Haas.

Nickel Solutions

Q.—What is your opinion of nickel fluoride and nickel chloride as stabilizers in nickel baths?

Also, we have some nickel stripping to do on copper boxes but the strip leaves the lead lining and solder black. Could you send me a formula for a strip that would leave lead white for replating? Strip to be used without current.

A.—If by stabilizer is meant one that will maintain the metal content better, nickel chloride is the better because the chlorides attach the anodes better than fluorides. Fluorides, however, maintain a more uniform hydrogen ion concentration. Nickel chloride is used in the nickel solution to the extent of 2 ozs. per gallon; fluorides as sodium fluoride, 1 oz. per gallon.

No acid strip is known that will strip off a plate and leave solder bright and white.—Joseph Haas.

Weathered Bronze

Q.—Will you kindly send us the formula for duplicating the finish that one sees on a penny after it has been in circulation some time. What we would like would be to use this finish on copper or bronze. Our best description of the finish we want would be to say it looks like a piece of bronze that has been aged by weather and handling, in other words a dirty brown.

A.—Imitation of used pennies can be obtained by boiling copper or bronze in solution of copper acetate, 2 ozs.; copper sulphate, 1 oz.; ammonium chloride, 4 ozs.; water, 1 gallon. Articles are removed from the above solution and rinsed in water and then dipped in potash solution; rinsed in cold and hot water and wiped off with a rag. Loose powdery sediment wiped off reveals the color desired.—Joseph Haas.

New Tentative Standard Classification For Old Metals

Following is a tentative standard classification for old metals recently drawn up by a committee and approved at the meeting of the Metal Division of the National Association of Waste Material Dealers to be held in Chicago on October 18th. Those handling metals are requested to study this classification carefully and forward any suggestions or criticisms to the Secretary, Times Building, New York, or to Henry Lissberger, Chairman of the Classification Committee, Woolworth Building, New York, or to George Birkenstein, Chairman of the Metal Division, 1030 West North Avenue, Chicago.

NO. 1 COPPER WIRE

To consist of clean untinned copper wire not smaller than No. 16 B. & S. Wire gauge to be free from burnt copper wire which is brittle and all foreign substances.

NO. 1 HEAVY COPPER

This shall consist of copper not less than 1/16 inch thick, and may include Trolley Wire, Heavy Field Wire, Heavy Armature Wire, that is not tangled, and also new copper clippings and punchings, untinned and clean and copper segments that are clean.

MIXED HEAVY COPPER

May consist of tinned and untinned copper, consisting of copper clippings, copper pipe and tubing, copper wire free of hair wire and burnt and brittle wire, free from nickel plated material.

LIGHT COPPER

May consist of the bottoms of kettles and boilers, bath tub linings, hair wire, burnt copper wire which is brittle, roofing copper and similar copper, free from radiators, brass, lead and solder connections, readily removable iron, old electrotype shells and free of excessive paint, tar and scale.

COMPOSITION OR RED BRASS

May consist of red scrap brass, valves, machinery bearings and other parts of machinery, including miscellaneous castings made of copper, tin, zinc and/or lead, no piece to measure more than 12 inches over any one part or to weigh over 60 lbs., to be free of railroad boxes, and other similarly excessively leaded material, cocks and faucets, gates, pot pieces, ingots and burned brass, aluminum composition, manganese and iron.

RAILROAD BEARING

Shall consist of railroad boxes or car journal bearings, must be old standard used scrap, free of yellow boxes, also iron-backed boxes, and must be free of babbitt, also free of excessive grease and dirt.

COCKS AND FAUCETS

To be mixed red and yellow brass, free of gas cocks and beer faucets.

HEAVY YELLOW BRASS

May consist of heavy brass castings, rolled brass, rod brass ends, chandelier brass, tubing, not to contain over 15% of tinned and/or nickel plated material; no piece to measure more than 12 inches over any one part and must be in pieces not too large for crucibles. Must be free of manganese mixture, condenser tubes, iron, dirt and excessive corroded tubing. Must be free of aluminum brass containing over 0.20% aluminum.

YELLOW BRASS CASTINGS

Shall consist of brass castings in crucible shape, that is, no piece to measure more than 12 inches over any one part; must be free of manganese mixtures, tinned and nickel plated material and must not contain over 0.20% aluminum.

LIGHT BRASS

May consist of miscellaneous brass, tinned or nickel plated that is too light for heavy brass, to be free of gun shells containing paper, ashes or iron, loaded lamp bases, clock works, brass and iron, automobile gaskets not to contain over 3% of iron.

OLD ROLLED BRASS

May consist exclusively of old pieces of sheet brass and pipe free from solder, tinned and nickel plated material, iron, paint and corrosion, ship sheathing, rod brass, condenser tubes and Muntz metal material.

NEW BRASS CLIPPINGS

Shall consist of the cuttings of new sheet brass to be absolutely clean and free from any foreign substances and not to contain more than 10% of clean brass punchings to be not smaller than ¼ inch in diameter.

BRASS TUBING

Shall consist of brass tubing, free of nickel-plating, tinned, soldered or tubes with cast brass connections. To be sound, clean tubes, free of sediment and condenser tubes.

NO. 1 RED COMPOSITION TURNINGS

To be free of railroad car box turnings and similarly excessively leaded material, aluminum, manganese and yellow brass turnings; not to contain over 2% free iron; to be free of grindings and foreign material especially babbitt. Turnings not according to this specification, to be sold subject to sample.

No. 1 YELLOW ROD BRASS TURNINGS

Shall consist of strictly rod turnings, free of aluminum, manganese, composition, Tobin and Muntz metal turnings; not to contain over 3% free iron, oil or other moisture; to be free of grindings and babbitts; to contain not more than 0.30% tin and not more than 0.15% combined iron.

NO. 1 YELLOW BRASS TURNINGS

Shall consist of yellow brass turnings, free of aluminum, manganese and composition turnings; not to contain over 3% of free iron, oil or other moisture; to be free of grindings and babbitts. To avoid dispute, to be sold subject to sample.

AUTO RADIATORS

All radiators to be subject to deduction for actual iron.

No. 1 PEWTER

Shall consist of tableware and soda fountain boxes, but in any case must test 84 per cent tin. Syphon tops to be treated for separately.

ZINC

Must consist of clean sheet and cast zins, also cast batteries to be free of loose oxide and dross, salamoniac cans and other foreign materials.

ZINC DROSS

Must be unsweated in slabs and must contain a minimum of 92% of zinc.

TIN FOIL

Shall consist of pure foil free of lead compositions and other foreign ingredients and matters.

ELECTROTYPE SHELLS

Must be hand picked and free of loose dross and chunks of dross.

BATTERY LEAD PLATES

Shall consist of dry battery lead plates, moisture not to exceed 1 per cent, allowance to be made for wood, rubber and paper and excess moisture.

NEW SHEET ALUMINUM CLIPPINGS

Shall consist of new sheet aluminum and cuttings. Must be free from oil, grease and any other foreign substances. Must be guaranteed not less than 98 per cent pure aluminum.

ALUMINUM WIRE

Shall consist of aluminum wire guaranteed 98 to 99 per cent pure aluminum and must be free from corrosion and any other foreign substance.

PAINTED SHEET ALUMINUM

Shall consist of painted sheet aluminum and must be absolutely free from iron, dirt or foreign substance.

ALUMINUM CASTINGS

Shall consist of aluminum castings, free from iron, babbitt, brass and any other foreign substance. Must not exceed 2 per cent of oil and grease.

OLD SHEET ALUMINUM

Shall consist of old and manufactured sheet aluminum. Must be free from painted sheet aluminum, iron, dirt and any other foreign substance.

ALUMINUM BORING

To avoid dispute, should be sold subject to sample.

ALUMINUM FOIL

Shall consist of Pure Aluminum Foil, free from paper and any foreign ingredients.

BABBITT METAL

Shall contain bearing metal of all kinds. Shall not contain scrap hard metal, Allen metal (which is copper and lead alloy) die cast, zinc boxes or type metal.

Conducting Safety Meetings

By N. V. B. ZIEGLER*

Personnel Director, The United States Aluminum Company, New Kensington, Pa.

There are many kinds of safety meetings, some very good, some very poor, and some just medium. I have had the privilege of attending perhaps two or three hundred of them, in connection with my work. It so happens that I am a kind of singing safety evangelist, and in this capacity I have been actively present at nearly all of the big safety rallies and schools of instruction held in the Pittsburgh district for the past five years or more.

Many of the meetings made very little impression on me, while others filled me with enthusiasm and a desire to do my little part in the great work of accident prevention.

We, of the United States Aluminum Company pay a great deal of attention to safety meetings. We are organized as follows: A Safety Department as a section of the Personnel Division, with a safety director, reporting directly to the personnel director. There is a safety committee in every department of the plant. These committees work hand in hand with the safety director. These department committees are organized into one large safety committee. They elect their own chairman and the safety director acts as secretary. They have a regular order of procedure in conducting their meetings. Minutes are kept and read at the meeting and everything is conducted in a serious businesslike way. These meetings are held once a month on company time, and last one hour, from 4 to 5 p. m.

The order of the business is as follows: Call to order; reading of minutes; safety paper or talks, by one or two members of the committee, or perhaps by the safety director or myself; unfinished business; new business; review of accidents; roll call; adjournment. It is interesting to note how serious and business like these men enter into their committee work. We have found this the best type of safety committee organization we have ever had and we are seeing results.

This is one type of safety meeting. Then we have another type which we have been carrying on for more than a year. Realizing that we were not getting close enough to the individual worker, we asked permission of our management to go into each department and conduct safety meetings throughout the plant. Our method is as follows: We notify the foreman of a certain department that we wish to hold a safety meeting; he gathers his employees together at some convenient point, and they are given two short safety talks, one by Mr. Hopkins, our safety director, and one by myself. The meetings are held at starting time, just after the noon lunch period. All is quiet; the machinery remains idle for 10 or 15 minutes while we talk safety to the employees, face to face, calling their attention to the great interest the company is manifesting by being willing to hold up production for this period of time in order to hold a safety meeting.

Then we have another type of safety meeting, the large community safety meeting. We have been conducting them now for four years, during November, coupled with the general "Thanksgiving No-Accident Month." These are large meetings, 1,200 or more in attendance, with great enthusiasm, community singing, brass bands, orchestras, vocalists, and the very best of safety speakers available. These meetings create a great deal of community interest in the safety movement. The daily press gives space liberally. Industries 10 or 15 miles away send large delegations. The weather has no effect on the crowds, it appears. The series of meetings closes with a large banquet. The tickets are usually purchased by the various industries and presented to their employees as an appreciation of their attendance at 75 per cent of the meetings.

It is necessary sometimes to put yourself out a little to show your sincerity. One of the most telling things we ever did was to come out at twelve o'clock at night to talk to the men on night turn. We have done this several times, and we have heard words of appreciation and statements from the men to the effect that "if these safety men are enough interested to come out at midnight, it is as little as we can do to be interested also."

We are guarding our machinery wherever it is needed, but we believe that the most effective work we are doing is the education of our employees through the medium of these personal touch channels.

* From The National Safety News.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1927 by THE METAL INDUSTRY PUBLISHING COMPANY

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year : : SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

ADVERTISING RATES ON APPLICATION. FORMS CLOSE THE FIRST OF THE MONTH

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ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
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Vol. 25 New York, November, 1927 No. 11

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EDITORIAL

BETTER DISTRIBUTION

With its customary vision and clear insight into the problems of business, the Department of Commerce has assumed the task of helping business to solve one of its greatest present day problems—the problem of distribution. Manufacturing methods have progressed at an unprecedented rate but distribution has lagged far behind. Dr. Klein, director of the Bureau of Foreign and Domestic Commerce estimates that in the last year $89,000,000,000 were spent in the United States for commodities and services. Just how and where this money was spent no one knows. Millions are wasted in chasing a "national market" for commodities which should be sold only locally; also in striving to fill the order book regardless of prices and profits.

The realization of the backward state of our distributing methods is still too young for us to have worked out any clear analysis or program of improvement. Many schemes are being tried, but so far no definite reports can be made as to their efficacy. Mail order houses which were supposed to cut costs by eliminating salesmen and retail selling expenses are now establishing retail display rooms and are using men to place their catalogs in the hands of prospects. Chain stores are beginning to add telephone and delivery service to their "cash and carry" system. Department stores have added innumerable types of service, making it possible for customers to spend the whole day under one roof, if they should so desire, allowing them to buy what they need, lunch there, take golf lessons, leave their babies under proper care and then be transported to where they wish by special buses.

The retailers are organizing co-operative buying associations. Wholesalers are organizing chains of retailers and manufacturers are dealing directly with retailers and even undertaking house to house selling. We have hand to mouth buying, installment buying and a dozen other methods of buying.

Some day out of this welter of experiments a generally applicable program will be worked out, but that time is not here yet.

How does all this effect the manufacturer, particularly of metal products, whose output goes very often into highly technical and comparatively obscure lines? Every manufacturer's product eventually goes, by direct or indirect routes, to commodities consumed or used by the general public. The manufacturer of the most involved scientific instrument for the testing of metals has a real interest in the cheapness with which metal products are distributed because the troubles or prosperity of the metal manufacturer react upon his business, and influence him in the purchase of new and improved equipment. Decreased costs of distribution mean decreased cost to the public and consequently greater distribution through increased sales.

At the present time, the trend of prices is falling, slowly it is true, but nevertheless definitely. There is, as a result, pressure all the way down the line to cut prices and lower costs. Manufacturing has responded nobly to this demand. Recent studies of census data show that the average employe in 1925 produced 50 per cent more in volume than a similar employe in 1900. Between 1923 and 1925 the output of our factories increased in value by $2,500,000,000, accomplished by a substantial decrease in the necessary personnel. It seems, therefore, that most of the burden has been thrown upon the producers while the middlemen in most lines have not yet put their shoulders to the wheel.

If the costs of distribution could be reduced in the same proportion as the costs of manufacturing have been lowered there would be substantial savings to the public and a more equitable distribution of the profits. It would mean a partial release from the intense pressure which has been borne by manufacturers; in many instances so great that they have been merely keeping their wheels turning at little or no profit, only to remain on the map and avoid being eliminated. Operation under such conditions cannot go on indefinitely. Industries can go on for a while without profit or even with slight losses, but there must be periods of prosperity or they die of starvation. The manufacturing industries have undergone many difficult periods in the last few years and have responded to the call for lower costs. Let the distributors take up their share of the load.

METALS IN WAR AND PEACE

Five thousand years ago bronze was used for spear heads. As the centuries went on men learned to make shields and armor, and bronze was used for these purposes. Little by little the arts were allowed to share in the use of these precious materials. Bowls and trays were made of copper. Long after that statues came to be cast in bronze. Steel became known and its superior strength eventually displaced copper as an aid to warfare, until modern firearms were invented and brass immediately as-

sumed a new importance. Note that for centuries and centuries metals were used primarily for destructive purposes.

During the last month two exhibitions were held in New York—the Industrial and Electrical Exposition and the National Business Show. At the industrial Exposition the large majority (an offhand guess would be 80 per cent) of the exhibits were of household appliances, kitchen utensils and lighting fixtures. In these the eye was met constantly by the flash of polished metal; aluminum, copper, nickel plate, silver, tinplate, and in many cases inside of the mechanism, zinc base die castings. The Business Show consisted largely of machinery for speeding office routine; typewriters, adding machines, calculating machines, desk fixtures, scales and a host of other devices to make business faster and more accurate. And the same glimmer of shining metal was evident over all.

An armorer of ancient times would look at such a sight sadly and meditate on the decline of mankind from its once virile state to its present decadence. How metals have fallen. Once on the battlefield and now in the kitchen. And if the modern metallurgist should tell him of what has happened to nickel and how its primary use has been diverted from armor plate to ice cream cabinets, refrigerators, kitchen fixtures and a hundred other peaceful and sedentary uses, he would give the world up for lost.

We believe that he would find few to agree with him. Metals are no longer the privilege of the warrior. They are the indispensable needs of a peaceful civilization.

HOW COPPER WAS NAMED

The Island of Cyprus which has figured in numerous international complications has another claim to fame which brings it nearer to us. It is one of the oldest sources of copper known to history. Whether Cyprus got its name from copper or copper got its name from Cyprus is a question which we prefer to leave to specialists in such subjects. The fact is, however, that for centuries before the time of the Egyptian king Tut-Ankh-Amen, its copper was valued all over the known world. Herod once operated its mines and the slag from these ancient reduction works can still be found on the island.

It is reported that an American mining engineer has begun to restore the mining industry in Cyprus and to bring it back to its former importance. In these days of steam shovel mining and direct extraction by leaching at the rate of millions of pounds per month, it would seem that this project has some very severe competition to meet. Nevertheless, many paying properties have been developed out of what seemed at first to be dead holes in the ground.

It would be singularly fitting to have the Island of Cyprus, so closely connected by name to copper, once more assume importance in its production.

TIN DEVELOPMENTS

According to a recently published statement by E. J. Cornish, president of the National Lead Company, the formation of a tin producers' association is being discussed in London for the purpose of controlling the world price of tin and holding it at £300 per ton (about 73 cents a pound). This combination would include American, British and Dutch producers, and in this international tin "cartel," the Americans would have at least a 25 per cent interest.

American industry will probably agree that the stabilization of tin prices would be a good thing. Whether it would be happy with the resting point at 73 cents a pound is another story, an the United States Steel Corporation, one of the world's largest consumers of tin, may have something to say on the subject.

Perhaps the aluminum producers will also have a word in this discussion. We published in a recent issue an item about the researches being carried on by the German Aluminum Research Institute on the possible use of aluminum for cans. This may not be of overwhelming importance at this minute, but it shows the handwriting on the wall.

Another complication to this problem is the fear that the world's alluvial tin deposits will be exhausted in a few years at the present rate of consumption. If this is a fact, then the stabilization of prices at any level may be difficult to enforce and the pressure to look for substitutes will certainly increase.

GOVERNMENT PUBLICATIONS

Bauxite and Aluminum in 1926. By James M. Hill, Bureau of Mines. Obtainable from the Superintendent of Documents, Washington, D. C., for 5 cents.

Antimony in 1926. By J. W. Furness, Bureau of Mines. Obtainable from the Superintendent of Documents, Washington, D. C., for 5 cents.

Tin in 1926. By J. W. Furness, Bureau of Mines. Obtainable from the Superintendent of Documents, Washington, D. C., for 5 cents.

Platinum and Allied Metals in 1926. By J. M. Hill, Bureau of Mines. Obtainable from the Superintendent of Documents, Washington, D. C., for 5 cents.

Mineral Resources of the United States in 1926. By Frank J. Katz and Martha B. Clark, Bureau of Mines. Price 20 cents. Obtainable from the Superintendent of Documents, Washington, D. C.

New Books

Metallurgy. By H. Wysor. Published by the Chemical Publishing Company. Size 6x9, 434 pages. Price $6.00.

Metallurgy is a general treatise for the use of students in engineering. It covers the extraction of metals from raw material through the working and casting processes. All of the common metals are included and a chapter is devoted to the noble metals.

Descriptions are also given of methods of casting, metal working and heat treatment.

Steel and Its Heat Treatment. By D. K. Bullens. Published by John Wiley and Sons. Size 6x9, 564 pages. Price $5.00.

This work, while outside the field of non-ferrous metals, is too well known not to be noticed in every journal on metals and should be in every library. It is probably the outstanding book of its kind. The third edition which has just been issued has been necessitated by the advances made in metallurgy and the art of heat treating steel.

The book is divided into 3 parts, namely, metallurgical, dealing with the general underlying principles and practices of heat treating processes; engineering, pointing out the peculiar qualities of the various alloy steels; production, relating to industrial heating as applied to heat treating processes. New chapters have been added and old chapters expanded.

A great deal of material has been added on the operation and control of heat treating equipment and apparatus, which covers the handling of furnaces using coal, oil, gas or electricity.

The Story of Chemistry. By F. L. Darrow. Published by the Bobbs-Merrill Company. Size 6x9, 528 pages. Price $4.00.

The Story of Chemistry is a popularly written description of the growth of the science of chemistry from the days of the alchemy to its present gigantic stature. It presents the developments chronologically, describing the work of the earliest outstanding chemists, their discoveries and the effect which their discoveries have had in aiding their followers. It points out the relation of chemistry to the various phases of life today, such as control of industrial power, agriculture, the cure and prevention of disease, the production of rubber, synthetics such as dye stuffs, etc. Explanations are also given of the modern theories of the constitution of matter.

Metals, of course, form an important part of this book, but necessarily, due to the breadth of the subject, have to be condensed into one chapter.

There have been a great many such books published lately but the student of science will find this book an interesting addition to his list.

Nema Handbook of Supply Standards. A guide book on the design, manufacture, and installation of electrical supply equipment. Size 9x6 inches, 231 pages, 125 illustrations and diagrams. National Electrical Manufacturers Association, New York. Price $3.50.

A completely revised edition of the Nema Handbook of Supply Standards has just been issued by the National Electrical Manufacturers Association of New York City, according to D. H. Murphy, vice-president in charge of the Supply Division.

This two hundred and thirty page book, which is indexed and illustrated, contains standards endorsed by one hundred and eighty-nine manufacturers of the Supply Division on Air Circuit Breakers, Attachment Plugs, Fuses, Cutout Bases, Knife and Enclosed Switches, Lamp Receptacles and Sockets, Laminated Phenolic Products, Metal Molding, Non-Metallic Flexible Conduit, Outlet Boxes, Overhead Trolley Line Materials, Panelboard and Distribution Boards, Signalling Apparatus, and Snap Switches, with approximately one hundred and twenty-five illustrations, diagrams of designs and methods, and numerous tables and curves.

These standards have been approved by the Standards Committee, the official body for the control of technical standardization within the Association. "This Handbook represents in printed form the experience and knowledge of practical and technical men, who have for years been most vitally concerned with the design, manufacture and installation of electrical supply equipment," says C. A. Bates, Chairman of the Standards Committee, and Chief Engineer of the Bryant Electric Company.

Technical Papers

Tarnish Resisting Silver Alloys. By Louis Jordan, L. H. Grenell and H. K. Herschman. Technologic Paper of the Bureau of Standards, No. 348.

As one phase of the technical research on the uses of silver, undertaken at the direction of the United States Senate Commission on Gold and Silver Inquiry, the Bureau of Mines and the Bureau of Standards have determined some of the physical and mechanical properties of a wide variety of silver alloys, and have made a study of their resistance to tarnish in accelerated laboratory tests.

In this investigation were prepared and tested alloys of silver with aluminum, cadmium, copper, magnesium, zinc, silicon, tin, bismuth, antimony tellurium, manganese, nickel, molybdenum, titanium, chromium, germanium, beryllium, gold and sodium, chiefly in binary alloys and to a lesser extent in ternary and quaternary alloys.

For most of the alloys prepared determinations were made of the freezing point, density, tensile strength and elongation of rolled and annealed sheets, and of the hardness of both the cast and the rolled and annealed alloys. Their comparative resistance to tarnishing was studied by exposure to a mixture of hydrogen sulphide and sulphur dioxide and by dipping in a sodium polysulphide solution.

Alloys of silver with cadmium or zinc were the most tarnish resistant of the workable binary alloys, but were also of the lowest tensile strength. Antimony and tin, either singly or together, were rather effective in strengthening zinc-silver alloys. These alloys also were readily workable and of marked tarnish resistance. Alloys of silver with 15 or 20 per cent of zinc or cadmium and 20 per cent of gold were very easily worked, possessed strength and hardness values more nearly comparable to copper-silver of sterling fineness than any of the other alloys prepared, and were also very tarnish resistant.

None of the alloys made and tested in this investigation can be described as "non-tarnishing." All could be tarnished under sufficiently severe conditions. Many of them, however, were distinctly more resistant to laboratory sulphur-tarnish tests than ordinary Sterling silver.

The Status of the National Safety Codes. American Engineering Standards Committee, New York.

Condensed resumes of the present status of forty-four national safety codes are listed, twenty-two of which have been completed under the rules of procedure of the American Engineering Standards Committee, while the rest are in course of development.

These national safety codes, are the result of years of painstaking work of joint committees composed of representatives of all interested groups. Manufacturers through their national trade associations; state commissions having regulatory authority over safety matters, or dealing with accident compensation through their national associations; employing groups through their trade associations; casualty insurance companies through their national organizations; the workers through the U. S. Department of Labor; national engineering societies; technical bureaus of the Federal Government; and independent specialists. These joint committees are called "sectional committees," and each works under the administrative leadership of one or more of the principal bodies interested. Such bodies are known as "sponsors."

The resumes are arranged according to subject matter. Copies of the codes and information in regard to the work may be obtained from the American Engineering Standards Committee, 29 West 39th St., New York, N. Y., or from the sponsors.

SHOP PROBLEMS

THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

CHROMIUM PLATING

Q.—Can you tell me how I can get a formula for plating with chromium? Work must be clear and white; just a flash.

A.—The following chromium solution has been developed and is giving excellent results.

Water	1 gallon
Chromic acid	20 ozs.
Chromic sulpate	1 oz.
Boracic acid	¾ oz.
Chromate of iron, fine powder, No. 348	1 oz.

Anodes, chrome steel; 40% chromium. Temperature of solution 95 to 115 deg. F., which must be maintained constant. Voltage maximum 12 volts; minimum 6 volts. Amperage per sq. ft. of surface area 500 maximum; 125 minimum at 6 volts.

Tank for solution, steel or steel glass lined. Products preferably to be nickel plated before chromium plating.

The products should be immersed in the solution before current is applied. Maximum current is advisable or nearly so for the first minute or two, then reduce to minimum current density; time of chromium plating, minimum of 4 minutes.

Upkeep of solution: maintain the water line constant. Note the density of the solution when first prepared with a Baume scale. Keep the density permanent by additions of chromic acid and chromic sulphate based upon original proportions used.

Distance between anode and cathodes; the latter the articles to be plated; not more than 3" circular articles should be entirely surrounded by anodes in the form of tubes or anodes made crescent shape, using 2 such anodes.

Final polishing when necessary, should be done with green polishing compound prepared from 2 parts stearic acid and 1 part green chromic oxide. Mix thoroughly by the aid of heat. Usual buffing operations to be used.

We would suggest also that you get in touch with the chromium plating companies advertising in THE METAL INDUSTRY for assistance.—C. H. P. Problem 3,691.

COLORING BRASS

Q.—Will you please give me a formula for the bronzing of brass; a green bronze on low brass, such as used on furniture trimmings. I can get a brown, black or blue with liver of sulphur or barium sulphide but not a green. Would like an inexpensive chemical color for quantity production.

A.—"Platers' Wrinkles" contains many formulae for coloring metals that will prove of interest to you. For the production of hardware greens, either of the following solutions can be used.

Water	1 gallon
Hyposulphite of soda	8 ozs.
Nickel sulphate or nitrate of iron	2 to 4 ozs.

Temperature 180 deg. F.

The following solution can also be tried out.

Water	1 gallon
Copper sulphate	12 ozs.
Sal-ammoniac	2 ozs.

Temperature as above. The sal-ammoniac may be increased to 4 ozs. or more to increase the depth of the green tone.—C. H. P. Problem 3,692.

FINISHING WHITE METAL

Q.—I am having a great deal of difficulty in getting a suitable plated finish for my heads and figures, which are made of white metal. These heads are hollow and sometimes are somewhat porous. I do not know how to overcome the porous condition. Am using what they call linotype metal.

Am looking for someone who can give me the following plated finishes, but so far have been unsuccessful: Brownish black, with green in shadows; bronze shade of brown, mottled with green.

A.—For your purpose, we believe an antimonial lead alloy would be more satisfactory than the linotype metal you are now using. Antimonial lead is a composition of 88% lead and 12% antimony. It runs sharp and clear in the mold. The porous condition you mention may be due to dross or arsenic impurities in the metal. Procure some green wood, preferably hickory or maple or other hard wood about 3 inches in diameter and 6 feet long. Put one end of the wood in the molten metal to reach the bottom. Due to the moisture in the wood, steam is formed and the results will be a boiling of the metal. Impurities in the metal will come to the surface and can be readily removed by skimming from the molten metal. Porous conditions also result from air being occluded in the molds. Air vents should be made where the porous spots occur. Incisions should be made with a flat or knife file extending through the cross section of the mold. Some times it is necessary to drill holes into the mold with a No. 18 drill, then brass rod or wire about No. 16 is filed square and then driven into the holes. The square of the rod or wire results in an air vent and allows the air and gases to escape. These suggestions may help you to overcome your problems. You do not mention whether you do any electro-plating. If not, the spray method of producing antique finishes, in which you are interested, will be most satisfactory for your product. Get in touch with lacquer firms advertising in THE METAL INDUSTRY. Some of these firms issue illustrated booklets showing the various finishes that can be produced by the air spray method of bronzing.

Job plating firms in your locality can also furnish plated finishes.—C. H. P. Problem 3,693.

IMPURE NICKEL SOLUTION

Q.—We are having considerable trouble with our nickel plating bath and would thank you to give us the benefit of your advice. Our nickel is peeling and that there is something foreign in the tank is indicated by a copper-like deposit on the anodes. When scraping off this responds to the test for copper; that is, nitric acid producing greenish fumes and the addition of ammonia producing an Indigo-blue.

We are doing chromium and nickel plating in the same room and it is our thought that chromic acid has been introduced into the nickel bath, either by the fumes from the chromium tank or perhaps by rinsing articles in the same water. Kindly advise if you think that the chromic acid would produce this copper-like deposit on nickel anode and further if this indicates the reason for the peeling of the nickel. As this trouble has practically caused a cessation of our plating business, we shall thank you for a prompt reply.

A.—It is presumed that if your nickel anodes coat over with a copper-like deposit, then the solution must in some manner have become contaminated with excessive amounts of copper salt. This condition frequently results from the use of nickel salts containing copper salt as the impurity. The test with nitric acid and ammonia is not conclusive. You can add excessive amounts of aqua ammonia to any nickel solution and it will become indigo blue. Furthermore, we do not believe that your fumes from your chromic acid plating solution have anything to do with the peeling of your nickel solution. We do, however, believe that the peeling is due to deposition of hydrogen with the nickel or a mist-like layer of hydrogen that forms immediately upon the articles when placed in the nickel solution and prevents true adhesion. To overcome your problem, make an addition of sodium perborate to your nickel solution, ⅛ to ¼-oz. per gallon will be ample. Figure out the total amount required for the nickel solution, then dissolve the material in as little hot water, 140 deg. F., as possible for its solution. Then add muriatic acid to the solution with constant stirring until it has the same acidity to blue litmus paper test as your nickel solution which produces peeling. We feel sure that the addition of sodium perborate will solve your problem. Make the addition at the close of the day's work.—C. H. P. Problem 3,694.

NICKEL SOLUTION

Q.—What is a good nickel solution for automobile parts?

A.—All around nickel plating solution for your purpose should be composed as follows: Water, 1 gallon; double nickel salts, 8 ozs.; single nickel salts, 4 ozs.; boracic acid, 1½ oz. Dissolve all the materials together in as little boiling water as possible. Add cold water, and the solution is then ready for use under usual plating conditions.—C. H. P. Problem 3,695.

OLD ENGLSH BRASS

Q.—I have to produce a stained old English brass on electric fixtures. At present I am oxidizing and relieving by hand with cyanide. I get a very good finish but it is too slow. Is there a solution for producing the same results by dipping?

A.—Some firms produce an old English finish on brass as follows. Polish the brass as usual, then copper plate for a minute or two in a hot cyanide copper solution. Wash afterwards, then immerse in a solution consisting of water, 1 gallon; polysulphide, ⅛ oz.; caustic potash, 1/16 oz. Dry out afterwards; scratch brush to get the brown finish similar to Japanese bronze. Relieve with pumice stone and water or pumice stone and tallow compound as may be required to give the antique effect. The following solution may also be tried out. Water, 1 gallon; caustic potash, 4 ozs.; red sulphide of antimony, 1 oz.; polysulphide, ¼-oz.; ammonia 26°, ¼-oz. Temperature 180° F.

Immerse the brass articles in the solution until brown, then wash in cold and boiling water, finally dry out, relieve to the finish desired, and lacquer.—C. H. P. Problem 3,696.

ORNAMENTAL BRONZE

Q.—Kindly advise how to get the warm yellow orange color now used so much on ornamental bronze work, such as on doors, bank railings, grill, etc.

A.—The yellow color to which you refer is produced from the natural color of the bronze metal which of necessity if a special alloy containing from 85 to 90 per cent copper and 15 to 10 per cent zinc. Aluminum is, however, used in the alloy to some extent to give the gold tint. When a special bronze is not used, then a great deal of the architectural bronze work seen in banks, etc., with the orange yellow tone will be found to have been lightly gold plated; afterward very lightly rubbed down with the finest of steel wool or very fine glass sand, then lacquered and finally waxed. The gold solution should be prepared as follows. Water, 1 gallon; sodium cyanide 96-98%, 1 oz.; sodium gold cyanide, ⅓-oz.; bisulphite of soda, ½-oz.; caustic potash, ¼-oz. Temperature 160 deg. F., voltage 3 to 4; anodes fine gold. To prepare the solution, dissolve the sodium cyanide and gold cyanide in 1 quart of the water at 140 deg. F., then add the balance of the 3 quarts then the bisulphite and caustic potash. The solution is then ready for operation.—C. H. P. Problem 3,697.

OXIDIZING WHITE GOLD

Q.—I have some chased white gold rings to be oxidized, and have been told there is an acid process which oxidizes them black. I have been using black lacquer but that is not satisfactory on small chased work. Can you give me a method for blue-white plating which is also used on white gold rings; one is known as Hoke white finish.

A.—You might write to the Roessler & Hasslacher Chemical Company, New York, and request them to send you a copy of Charles H. Proctor's method of oxidizing or antique finishing white gold with Platin-Nig.

The new blue-white finish to which you refer is a chromium flash deposit. It is termed "stay white," "ever white," etc. The solution best adapted for chromium flash deposits is: Water, 1 gallon; chromic acid, 20 ozs.; chromic sulphate, 1 oz.; chromic carbonate, 1 oz. Anodes, chrome steel (special). Temperature of solution, 120 deg. F., voltage minimum 6, use small anodes in strips so that the surface is about one-half of the surface of the work to be plated. It is advisable to flash all white gold articles in a bright nickel plating solution before chromium flashing. The latter should be done in 4 minutes. Hoke white, we believe, is an electro-deposit of tin. We do not know just what basic formula is used. For your purpose, try the following: Water, 1 quart; caustic potash, 4 ozs.; powdered yellow rosin, ¼-oz.; tin chloride, 1 oz. Anodes, sheet steel; temperature 180 deg. F., use as a flash deposit only. Polish with a soft cloth after plating. We might suggest that Masury's japan black be tried out to replace black lacquers, or Glidden Varnish Company's Jap-a-Lac, either dull or bright blacks.—C. H. P. Problem 3,698.

PEELING NICKEL

Q.—We would like to know what makes our nickel plating crack and peel off after about 20 minutes plating. The hydrogen bubbles work quite rapidly. We have tried to eliminate this by adding carbonate of nickel, but that doesn't seem to help much, and we know we have plenty of metal in the solution.

A.—Your trouble in nickel plating, due to peeling or cracking of the nickel deposit, is presumably due to hydrogen deposited with the nickel. Nickel carbonate is of no value in such a case. Nickel chloride about 1 oz. per gallon of solution quite frequently eliminates the trouble. However, it may be necessary to add a hydrogen controlling factor. Sodium perborate is the best factor for the purpose. Use ⅛-oz. per gallon of solution first; a second repetition may be necessary. Figure the number of gallons of solution then dissolve the total amount of sodium perborate in as little hot water as possible, 120 deg. F. When all is dissolved, add muriatic acid with constant stirring until the acidity is comparable with your nickel solution by blue litmus paper test. Stir the sodium perborate solution thoroughly into the nickel solution at the close of the day's work. If you cannot obtain sodium perborate then you may temporarily add hydrogen peroxide.—C. H. P. Problem 3,699.

RUST PREVENTION

In our September issue under the heading "Rust Prevention" on page 388 appeared the statement in answer to Problem 3,681, "You can deposit the metal (chromium) without patent infringement if you operate a strictly commercial solution." We have since then been advised, however, that there are many patents covering various commercial solutions and the methods of using same.—Ed.

TINNING

Q.—Can you give me the information for the plating of tin on ice cream packers; whether it is electro or not, and the best formula for plating the same.

A.—Ice cream packers and other similar materials used in connection with the ice cream industry are usually tinned by what is termed the "hot tinning" method. To accomplish this, see a short article in the June, 1927, issue of THE METAL INDUSTRY, page 223, entitled "Hot Tinning Cast Iron." The methods outlined can be used advantageously in hot tinning any articles made of iron or steel. In your particular case, the hydrofluoric acid pickle and the tumbling in sand, etc., mentioned in the article, can be dispensed with. The steel parts to be tinned, however, should be free from grease, etc., washed thoroughly in water, then pickled in a solution consisting of water, 1 gallon; hydrochloric acid, 1 to 2 gallons; temperature 140-160 deg. F. Rust, etc., will be removed in a few minutes when the articles are immersed in this acid dip. Afterwards wash in water, scour down the surface with sharp glass sand, then hot tin as outlined.

Electro-tinning, however, is coming into use for tinning such articles. The procedure is to cleanse and pickle as outlined, then electro-tin plate in the following solution: Water, 1 gallon; sodium stannate, 24 ozs.; tin chloride, 1 oz.; caustic potash, 2 ozs.; powdered yellow rosin, 1 oz. Anodes, pure tin; voltage 3 to 4; temperature 160-180 deg. F. To prepare the solution, dissolve the sodium stannate and tin chloride in 3 parts of the water; in the balance 1 quart dissolve the caustic potash and the rosin. Mix the solutions thoroughly. After plating the articles, washing and drying, rub down with sharp sand to produce a bright lustre to the tin. Time of plating is from 10 to 30 minutes.—C. H. P. Problem 3,700.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,642,349. September 13, 1927. **Alloy Structure.** Harry M. Williams and Alfred L. Boegehold, Dayton, Ohio, assignors to General Motors Research Corporation, Dayton, Ohio.

The process of producing bearing materials which comprises intimately mixing finely divided alloyable metals and a finely divided non-alloying material of itself capable of decomposing at high temperature to give off a non-corrosive volatile substance and to leave, as the result of its disintegration, a residue capable of acting as a supporting filler for the bearing material; compressing the mixture; and heating under non-oxidizing conditions to cause the said decomposition.

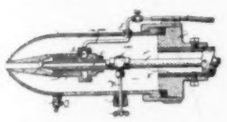
1,642,351. September 13, 1927. **Metal Furnace.** Walter Alderdice, Brooklyn, N. Y., assignor to Alfred W. Channing, Inc., New York, N. Y.

A metal furnace having a casing and a metal pot therein a stationary member associated with the metal pot for conducting the molten metal to the casing of the furnace, a movable trough member having a chamber arranged to receive the molten metal from said stationary member, and a pouring spout to receive the molten metal from said chamber.

1,642,358. September 13, 1927. **Method of Treating Lead Dross.** Oliver Perry Chisholm, Durango, Colo., assignor to American Smelting and Refining Company, New York, N. Y.

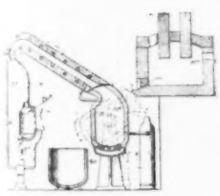
The process of treating impure lead dross to remove copper as a speiss, which consists in mixing the dross with fluxes and subjecting the same to a smelting temperature to promote the formation of a speiss containing copper and lead, and then replacing the lead with iron in said speiss without replacing the copper.

1,642,418. September 13, 1927. **Molten-Material-Spraying Apparatus.** Louis P. Kovanda and Jay H. Hubbell, Los Angeles, Calif.; said Hubbell assignor to said Kovanda.



In a molten material spraying apparatus, a reservoir adapted to contain molten material, a nozzle, a molten material-conveying line connecting said reservoir and nozzle, and connected heating jackets surrounding said reservoir, line and nozzle respectively.

1,642,683. September 20, 1927. **Apparatus for Production of Pure Metal.** Samuel L. Madorsky, Chicago, Ill., assignor to Gathyms Research Corporation, Chicago, Ill.



In apparatus of the class described, a meling furnace; a converter having a spout; a discharge duct; said converter being movable to align said spout with said furnace or with said duct; means to supply reducing gas to the contents of said converter, and means associated with said duct to pre-heat reducing gas prior to such introduction.

1,642,884. September 20, 1927. **Soldering Flux.** Charles J. Meier, Louisville, Ky.

A soldering flux comprising the reaction products of the following materials, in about the quantities named, viz:

Zinc	240 grs.
Hydrochloric acid (1.2 sp. gr.)	567 grs.
Ammonia water (0.9 sp. gr.)	142 grs.
Ammonium chloride	15 grs.
Bismuth subnitrate	60 grs.
Alcohol	12 c. c.
Spirits of turpentine	2 c. c.

1,643,304. September 27, 1927. **Silver-Silicon Alloy and Process of Making the Same.** Michael G. Korsunsky, Jackson Heights, N. Y., now, by judicial change of name, Michael George Corson, assignor to Electro Metallurgical Company, a Corporation of West Virginia.

As a new article of manufacture, an alloy containing silver in preponderating proportion, silicon in amount of from 1.5 to 6%, and 1 to 50% of a member of the group of metals characterized by the formation of a solid solution with silver.

1,643,425. September 27, 1927. **Art of Furnace Lining.** David L. Summey, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn.

The method of making the refractory structure of an electric furnace having an interior channel, which comprises forming a pattern having the shape of the channel to be formed, tamping refractory material about said pattern, causing a portion of said pattern, in a dividing strip running longitudinally around the body thereof, to be destroyed, whereby the pattern is divided into two portions movable one toward the other.

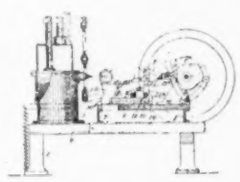
1,643,922. September 27, 1927. **Process of Precipitating Copper from Sulphate Solution.** Niels C. Christensen, Salt Lake City.

The process of recovering copper from sulphate solutions, which comprises treating a solution containing copper sulphate with metallic lead, while continuously mechanically removing the coating of lead sulphate formed upon the lead, to thereby precipitate the copper from said solution and to form lead sulphate in admixture therewith, and thereafter separating the mixture by action of a differential solvent.

1,644,000. October 4, 1927. **Production of Silicon-Iron and Aluminum-Copper Alloys.** Frank D. Shumaker, deceased, Pittsburgh, Pa., by Josephine J. Shumaker, executrix, Pittsburgh, Pa., assignor to Aluminum Company of America, Pittsburg, Pa.

In a process of making silicon-iron and aluminum-copper alloys from materials containing oxids of aluminum, silicon, iron, and titanium, the steps comprising electrothermally smelting the aluminous material in the presence of iron and with a suitable fluxing agent, and producing thereby ferro-silicon alloy containing more or less of the iron and titanium of the aluminous material treated, and a highly aluminous material or slag of low iron and titanium content but containing fluxing agent.

1,644,054. October 4, 1927. **Automatic Machine for Casting Metal Under Pressure.** Otto Eckert, Nuremberg, Germany, assignor to Präcisionsguss-Fabrik Gebr. Eckert, Nuremberg, Bavaria, Germany.



An automatically acting machine for casting metal under pressure combination with the main shaft of the machine and with the mould composed of several elements, a cam disc keyed on said main shaft said cam disc being of symmetrical shape and designed to control all the operations of the machine, a sliding plate carrying said mould elements, an oscillatable fork hingedly fixed to said sliding plate for communicating a to and fro movement to said sliding plate, and a roller in the end of each arm of said folk, said rollers bearing on the circumference of said cam disc so that the line which connects the centres of said rollers extends always along a diameter of said cam disc.

1,644,425. October 4, 1927. **Alloy.** Charles A. Geatty, Elkridge, Md.

An alloy for linings for brake bands and the like containing by weight lead 95%, antimony 3% and copper 2%.

1,644,431. October 4, 1927. **Process of Purifying Cadmium.** Henry Howard, Cleveland, Ohio, assignor to The Grasselli Chemical Company, Cleveland, Ohio.

Process of purifying cadmium which comprises treating cadmium sponge with caustic soda solution of 45° Bé. at its boiling temperature in quantity sufficient to dissolve the zinc content of the cadmium sponge.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Chromium Plating Industry to Receive Benefit of Organized Research and Development

By ANDREW E. BALDWIN

Vice-President and Director, United Chromium, Inc., 30 E. 42nd St., New York

Industry is being awakened to the present and future possibilities of electro deposited chromium. Having the power of conserving other metals through its properties of resisting wear, heat and corrosion, chromium plating is already solving many recognized industrial problems. Moreover, there is something of romance and mystery about this element chromium which has attracted scientists, manufacturers, and far-visioned men of prominence in the business world, for every day suggestions are made which apparently open new fields for its usefulness. Whether its greatest value lies in the fact that it does not tarnish, or that it has a very low co-efficient of friction, or that it forms a hard surface on softer metals, cannot be stated at this time.

Much information about chromium plating, although published with the best of intention, has proved to be harmful. Some have been induced to equip for chromium plating prematurely through published formulas of solutions, only to find themselves balked and discouraged by failures and irregular results. Shops claiming to be fully able to do chromium plating have accepted contracts which they could not fill. Manufacturers have become enthusiastic over the possibilities of chromium plating applied to their products and then have been disappointed in their inability to procure a satisfactory source of commercial plating. Much of this has been due to lack of proper study of the problems to be met and of the careful development of the right procedure necessary to handle the article in a commercial way.

Some electro platers have assumed the attitude that a group of powerful interests were attempting to weave a strong patent structure around chromium plating and then, taking an offensive position behind this patent bulwark, attempting to extort money from industry for licenses, just as in the old feudal days the baron in his castle extracted tithes from his tenants. Because of a misunderstanding, the chromium plating patent bugaboo made its appearance and for that reason much has been said and written about the patent situation. This discussion will ignore the patent question and will attempt to point out that, entirely apart from the patent situation, there is an economic justification for an organized group which will act as the clearing house for all information in connection with chromium plating and endeavor through organized effort to develop the science to its greatest possibilities and make its discoveries available for commercial purposes in exchange for a reasonable supporting compensation.

In the short time that the application of chromium plating to industry has been studied, it is apparent that no one type of deposit is satisfactory for all uses. Varying degrees of hardness and thickness are necessary as the various problems of industry in connection with wear and corrosion are attached. Many ingenious contrivances have been devised to offset the inactivity of chromium in an electrolytic solution. The application of chromium to high-speed machinery is a specialized problem in itself. Chromium plate as a substitute for case hardening is another field which offers large possibilities.

The general use and application of electricity has been advanced by co-ordinated research and study until what was once a basis of laboratory experimentation is now one of man's greatest servants. It is very doubtful whether the extensive development and application of electricity to industry ever would have been realized had it not been for the well-financed, organized effort of such companies as General Electric and Westinghouse. While an occasional inventor working independently will develop something of great value in a particular field, generally speaking, most of the big discoveries are made only by years of the hardest kind of intense experimentation in well-directed and well-financed laboratories. There are few miracles in science.

There is a group of far-visioned men in this country who believe that chromium plating is destined to become one of the most valuable contributions to industry. These men have pledged, through the formation of United Chromium, Incorporated, a great deal of capital further to develop the science of the electro-deposition of chromium. They anticipate that if, through this organization, there can be developed and perfected the application of chromium plating to industry, their efforts will be rewarded by the sense of a large achievement in the field of conservation. The success of a business is measured by profit or loss, as well as the result of its activities. An organization which can demonstrate that it has a place in the industrial world will be supported. It is entitled to a fair compensation for service rendered.

Certain electro platers and manufacturers do not entirely understand the objective of the organization which has been conceived for the purpose of gathering together all the information regarding what has been done with chromium plating and organizing and revising this data, and improving the technique so that the best experience and knowledge is immediately available for anyone who wishes to undertake chromium plating. Further, it is the purpose of this group of men to maintain extensive research departments which, fully realizing the limitations of chromium plating as it is done today, will work for the development of new processes and technique which will be made available for commercial purposes in the future.

It already has been recognized that the electro-deposition of chromium is more of a science than just the depositing of a coat of chromium upon another metal. Problems requiring infinite study are encountered every day in a laboratory which is studying the commercial application of chromium. For this reason, an independent plater who makes his own experimental solution from a published formula will only have just started. He may be able to plate a few articles successfully, but will still be far away from being able to get the repetition of exact results which are necessary in order to serve the many demands of industry. Such an operator might be compared to the experienced amateur who buys the parts and assembles his radio set at home. Most of us know from experience that home-made radio sets are successful to a degree in that they do receive radio impulses. We also can appreciate that there is a great deal of difference in tone quality and long distance reception between the amateur product and the balanced laboratory product of leading manufacturers in the electrical field.

United Chromium, Incorporated, is in a position to offer to a manufacturer today the benefits of the best that has been developed in chromium plating in the past years and to furnish his plating department with an engineering service which will carefully supervise and instruct. Once he becomes a subscriber to its service he will be kept abreast of developments in chromium plating which over a period of years could only be matched by such an organization. Any independent manufacturer who is not devoting all of his efforts to chromium plating can ill afford to ignore the potential value of the comprehensive and co-operative engineering service outlined as being available now.

NEW BURNISHING BARREL

The Lupomatic Tumbling Machine Company, Inc., of New York has placed on the market a new heavy duty burnishing barrel. This machine is built especially for articles that are heavy and large and at the same time frail.

The outer tank and bearings have been re-designed to meet the modern demand for a heavy duty machine. A gear drive is used which saves power and allows the tumbler to revolve constantly at the same speed.

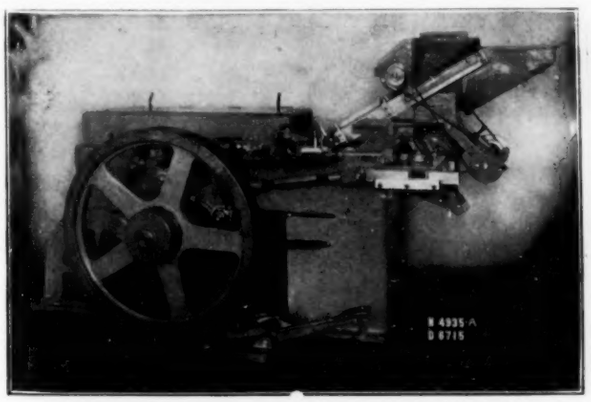
AUTOMATIC BOLT HEAD TRIMMER

An entirely new design of automatic bolt head trimming machine has recently been added to the line of cold-process bolt machinery manufactured by the Waterbury Farrel Foundry & Machine Company, Waterbury, Conn. This machine, which is illustrated in Fig. 1, is said to possess these outstanding features: (1) complete separation of chips and trimmed blanks; (2) higher speed than ever before attained; (3) positive ejection of all trimmed blanks through the die; (4) ability to trim any length without special tooling; (5) newly designed rotor hopper feed; (6) improved transfer mechanism for carrying the blanks from the feed chute to the tools; (7) accessibility for setting up and adjusting; and (8) provision for either belt or direct-geared enclosed motor drive.

The blanks to be trimmed are agitated in the hopper by a slowly revolving rotor, the blades of which pick up the blanks and deposit them in the chute. A clearing wheel having spring kickers locates the blanks correctly in the chute, from whence they slide down to a finger on the horizontal transfer slide which carries them to the center of the machine. Here a pair of spring fingers grip the blank and swing it down into line with the tools.

The punch is fixed in the frame and the die in a block on the reciprocating gate, a construction that is entirely new in this type of machine and one that makes possible the use of a positive knock-out for any length of blank. The blanks are held in line with the tools just long enough for the die to push them into the punch.

The work is trimmed by pushing the die over the projecting head of the blank. The gate is operated through a special mechanism which produces a dwell at the end of its forward position, to facilitate ejecting the blanks through the die. The cutting or shearing thrust is taken by the punch through which the knock-out pin operates. After trimming, te blanks are knocked out of the punch and through the receding die by means of a positive cam knock-out. They then drop down through the gate into an inclined chute and are thereby delivered through a hole in the pedestal into a suitable receptacle on the floor. The chips that fall from the trimmed bolt head drop into another chute leading to a perforated sheet iron box within the pedestal. This box permits the liquid to drain into a coolant tank directly beneath, from which a constant flood of fluid is pumped to the face of the die, whenever required.



AUTOMATIC BOLT HEAD TRIMMER

NEW SPRAY GUN

The Spraco Painting Equipment Company, Boston, Mass., is making a new pressure cup gun which is designated No. 14-A. This gun enables the job shop finisher to use the heavy materials hitherto possible only on gravity or pressure equipment. It is recommended especially for applying surfaces as it is claimed that it will put on the equivalent of two ordinary cup gun coats and use a mixture ranging from 75 per cent surfacer and 25 per cent thinner to 90 per cent surfacer and 10 per cent thinner. In other words, this gun gives the job shop the advantage of the same type of equipment as the large production shop through the application of pressure to a small (quart) container.

The following advantages are also claimed:

1. There is no powdered surface as the speed of application gets the material on wet enough to blend into a proper finish.
2. The gun while spraying may be held in any position without leakage as there is no open vent hole.
3. Will lay on a heavy coat to fill scratches, eliminating puttying.
4. Eliminates the need for pressure tank and material hose which are objectionable to the average shop on account of the frequent change of colors and small amount of materials used.
5. Eliminates the excessive cost of cleaning equipment between color changes.

SPRACO NO. 14-A GUN

NEW TOUCH-UP AIRBRUSH

The new Paasche Touch-Up airbrush is specially designed to meet the demand of the decorator—embodying all the Paasche Multiplehead Triple-Action features. This Paasche Type UATF Touch-Up airbrush has, it is claimed, proved a success in applying artistic decorative finishes.

It gives a smooth finish in coloring, antiquing, stippling, stenciling, veiling and tinting any articles requiring a "selling finish," such as lamp shades, fish-baits, pennants, book covers, ladies' slippers, silk waists, ribbons, and, of course, for use in touching-up the larger articles, such as automobiles, trucks, furniture, etc.

It is manufactured by the Paasche Airbrush Company, of Chicago, Ill.

TOUCH-UP AIRBRUSH

DIRECT JET MELTING FURNACE

The Johnson Gas Appliance Company, Cedar Rapids, Iowa, is placing on the market a new direct jet melting furnace with a capacity of 18 pounds of lead. This pot is of special construction and made to last a long time without burning up, has a pouring lip and handle for removing the pot, and is equipped with a shutoff valve and pilot light.

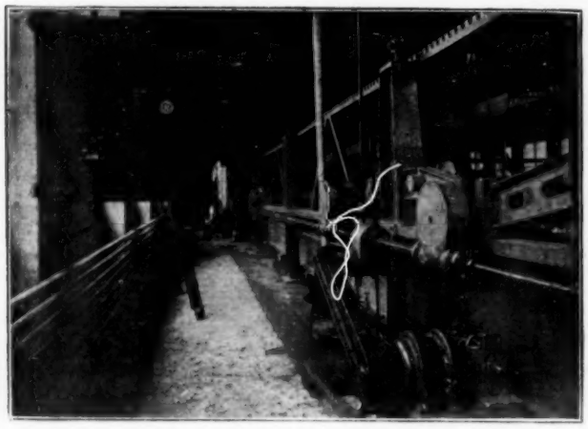
The rate of melting is said to be its capacity (18 pounds) in less than ten minutes.

18 LB. LEAD POT

AUTOMATIC CLEANING AND PICKLING

The Bridgeport Brass Company, Bridgeport, Conn., has installed two automatic cleaning and pickling machines on which electric control is applied for the first time to govern the various steps in the process. The machines in question not only eliminate several men from the department, but also provide greater production.

Carriers on an endless chain convey the work to be cleaned and pickled from a filling station, through the various baths, to an unloading station. General Electric motors and control are used. On pressing a button, the carriers move from one position to the next and stop. After a predetermined time all carriers move to the next position.



PICKLING AND CLEANING MACHINE

The automatic starting, conveying and stopping on such machines has usually been accomplished, in previous installations, by the use of an intermittent gear. In the present instance, electric control is used. In the mechanical method, the intermittent gear receives the brunt of the shock, with the result that it becomes a probable trouble center. By using electric control of the driving motor, more of a cushion effect is obtained and less strain and jar are transmitted to the machine.

The machine described was built by the U. S. Galvanizing and Plating Equipment Company, of Brooklyn, N. Y., and the electric equipment is of General Electric manufacture.

POLISHING AND BUFFING COMPOUNDS

Harrison and Company, Haverhill, Mass., manufacture a line of polishing and buffing compounds for metals and steel. Their No. 5 black or gray coarse is used on wheels made up with 180 and finer emery, corundum, garnet or carborundum. It can also be used on plain leather wheels, wood wheels or cloth wheels sewn from the center to the outside in circles.

The No. 4 AAAA black or gray fine is claimed to be a good crocus. The extra dry black is recommended.

Wonder polish, green and white velvet are used as a crocus and for a mirror finish.

EQUIPMENT AND SUPPLY CATALOGS

Grinding. Hardinge Company, York, Pa.

Abbott Burnishing Materials. Abbott Ball Company, Hartford, Conn.

Drying by Steam. Ruggles-Coles Engineering Division, York, Pa.

Plumrite Brass Pipe. Bridgeport Brass Company, Bridgeport, Conn.

The History of Sanitation. Bridgeport Brass Company, Bridgeport, Conn.

Mechanical Sledge. Chambersburg Engineering Company, Chambersburg, Pa.

Isolantite Tower Packings. Isolantite Company of America, Belleville, N. J.

125 Years of Usefulness. E. I. du Pont de Nemours & Company, Wilmington, Del.

Diagonal Deck Sand or Slime Table. Deister Concentrator Company, Fort Wayne, Ind.

Brown & Sharp Works. Brown & Sharp Manufacturing Company, Providence, R. I.

Exclusive Metal Products fashioned by the Jamestown Metalsmiths, Inc., Jamestown, N. Y.

Stevens-Duryea Plant Sale, Chicopee, Mass. Willard Welsh Realty Company, Inc., Boston, Mass.

Electric Heat at J. L. Thompson Manufacturing Company. Edison Electric Illuminating Company, Boston, Mass.

Direct Connected Turbine Generator Units. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

The Phomene Accumulator for Automatic Foam Fire Protection. Pyrene Manufacturing Company, Newark, N. J.

Practical Sand Blast Equipment and Dust Suppression Equipment. Ruemelin Manufacturing Company, Minneapolis, Minn.

Venturafin method of unit heating as applied by the Austin Company in the Oakland-Pontiac plant. American Blower Company, Detroit, Mich.

Automatic Control of Heat in Various Industries, such as wire tinning, die casting, galvanizing, etc. Brown Instrument Company, Philadelphia, Pa.

Smooth Finish Machining of Low Carbon Plain and Alloy Steels. By J. S. Vanick and T. H. Wickenden. International Nickel Company, New York.

The Monotron for the measurement of hardness of metals and other materials. Shore Instrument & Manufacturing Company, Jamaica, N. Y.

Year Book of the Merchants' Association for 1927. A summary of the activities of that association and lists of the officers, directors and committee members.

General Electric Publications. Auxiliary Welding Resistors; Centrifugal Air Compressors; Factories and Statement of Orders Received, Sales and Earnings. General Electric Company, Schenectady, N. Y.

Modern Polishing. A booklet describing the manufacture of synthetic abrasive grains, Lionite and Carbonite. The booklet contains data on polishing wheels, glue and correct methods of setting up and drying wheels. General Abrasive Company, Niagara Falls, N. Y.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

COPPER & BRASS RESEARCH ASSOCIATION

HEADQUARTERS, 25 BROADWAY, NEW YORK.

At the seventh annual meeting of the Copper & Brass Research Association, held October 20, 1927, at its offices, 25 Broadway, New York City, R. L. Agassiz, chairman of the Calumet & Hecla Consolidated Copper Company, was re-elected president.

The following were among those elected members of the board of directors, the first four being on the executive committee:

John A. Coe, President—The American Brass Company.

F. S. Chase, President—Chase Brass & Copper Company, Inc.

Edward H. Binns, President—C. G. Hussey & Company.

Barton Haselton, President and General Manager—Rome Brass & Copper Company.

Francis J. Bassett, Sales Manager—Taunton-New Bedford Copper Company.

Charles F. Dietz, President—Bridgeport Brass Company.

B. Goldsmith, President—The National Brass & Copper Company.

E. O. Goss, President—Scovill Manufacturing Company.

At a meeting of the board of directors the following officers were elected: President, R. L. Agassiz; vice-presidents, C. F. Kelley, F. S. Chase, Walter Douglas, Barton Haselton; treasurer, Stephen Birch.

William A. Willis, who has managed the association since its formation, was re-elected to that position.

H. H. R. Spofford was re-elected secretary.

The following copper and brass fabricating and distributing companies are now members of the association:

The American Brass Company.
Bridgeport Brass Company.
Chase Brass & Copper Company, Inc.
T. F. Conklin Brass & Copper Company.
Dallas Brass & Copper Company.
C. G. Hussey & Company.
Mueller Company.
The National Brass & Copper Company.
New England Brass Company.
New Haven Copper Company.
New Jersey Wire Cloth Company.
The Paper & Textile Machinery Company.
The J. M. & L. A. Osborn Company.
Rome Brass & Copper Company.
Scovill Manufacturing Company.
Taunton-New Bedford Copper Company.
The Foster-Wheeler Company.
Wolverine Tube Company.

PHILADELPHIA BRANCH, A. E. S.

HEADQUARTERS CARE OF GEORGE GEHLING, 5001 EDMUND STREET

The annual banquet of the Philadelphia Branch will be held at Mosebach's Hall, Girard Avenue and 13th Street, Philadelphia, Pa., on November 19, 1927.

The Educational Session will start at 3:30 P. M. and will be presided over by Willard M. Scott. The speakers and their subjects will be as follows:

Charles H. Proctor. The Chromium Situation from an Outside Standpoint.

Dr. Hiram Lukens, University of Pennsylvania. Cadmium as Used by the Plating Industry.

Dr. William Blum, Bureau of Standards, Washington, D. C. Chromium Plating.

Clayton Hoff, Grasselli Chemical Company, New York. Commercial Cadmium Plating.

Mr. Hakanson, Meaker Company, Chicago, Ill. Application of Electricity to Electro-Plating.

P. W. Ellwanger, Charles L'Hommedieu & Sons, Chicago, Ill. The Relation of Polishing and Buffing to Chromium Plating.

Henry Rinhof, New York. Compositions, Their Uses and Abuses.

The banquet will start at 7 P. M., and there will be plenty of food and amusements for all.

WASTE MATERIAL DEALERS

HEADQUARTERS, TIMES SQUARE BUILDING, NEW YORK.

A very important meeting of the Metal Division was held on Tuesday, October 18th, at 2 P.M. This meeting was particularly important because a new metal classification was approved. A draft of the new classification will be found on page 463 of this issue.

George Birkenstein, chairman of the Metal Division, presided.

Personals

CORTLANDT W. HANDY

Cortlandt W. Handy, recently elected president of Handy & Harman, silver refiners of New York, was born December 18, 1888, in Short Hills, N. J. He was brought to New York City when about five years old, and attended the New York City schools and the Lawrenceville Preparatory School. He entered Princeton University in the fall of 1907 and was graduated with the class of 1911 with the degree of Bachelor of Literature. After graduation he worked with the Farmers' Loan and Trust Company, New York, for a year and studied bookkeeping and accounting at night. In the spring of 1912 he became bookkeeper for the Charles S. Platt Company, New York, gold and silver refiners and dealers. At that time the Platt company was owned by Handy & Harman but operated as a separate unit. It is now the New York plant of Handy & Harman.

CORTLANDT W. HANDY

In 1915 Mr. Handy became assistant manager of Charles S. Platt Company and in 1916 was transferred to the main office of Handy & Harman in the cashier's department. He left his work with this company in June, 1916, to be mustered into the Federal Service with Squadron A of the New York National Guard and served as a Sergeant on Mexican Border duty until the end of December, 1916, when his Squadron returned to New York, and he was mustered out.

He continued his work in the main office of Handy and Harman until September, 1917, when he was ordered to active duty as a First Lieutenant of the Aviation Section, Reserve Officers Signal Corps. He was sent to Princeton, N. J., as Adjutant to assist in organizing the U. S. School of Military Aeronautics at Princeton University. He was promoted in August, 1918, to Captain of the U. S. Army Air Service, serving as Personnel Officer, and assistant to the Commandant. He was discharged from the U. S. Army at Princeton, December 31, 1918.

Mr. Handy returned to Handy & Harman in January, 1919, and was elected secretary of the corporation in April, 1923, and president in April, 1927.

At the present time he resides in Woodmer, L. I., and is a member of the following clubs: University Club, Princeton Club, Metal and Rubber Club, Rockaway Hunting Club, Sons of the Revolution, Nassau Club and Cap and Gown Club of Princeton.

J. N. McDonald, Anaconda Copper Mining Company, New York, recently won a golf tournament of the Metropolitan Advertising Golf Association at Montauck Downs, L. I.

Arthur F. Braid, sales manager of the Metals Department of the Metal and Thermit Corporation, New York, has recovered from an operation for appendicitis, and is now back at his desk.

J. W. Bunting, president of the Bunting Brass and Bronze Company, Toledo, Ohio, sailed for England on September 17, to remain there several weeks, beginning an extended investigation of European markets with reference to the products of his company.

Robert S. Storrs, engineer for the Torrington Manufacturing Company, Torrington, Conn., sailed October 26th on the S. S. Aquitania for England, to be absent about six weeks. Mr. Storrs will be in England, France and Germany, but will spend most of his time with W. H. A. Robertson & Company, Ltd., of Bedford, England, with whom the Torrington Manufacturing Company is associated.

Dr. P. D. Merica, research director of the International Nickel Company, New York, sailed recently for Paris to attend the technical conference and a general exposition, held under the auspices of the Centre d'Information du Nickel. These conferences were designated under the heading "Nickel Week," being on the metallurgy and application of nickel and its derivatives as well as alloys. The exposition was a splendid success, sixty exhibitors participating, showing practically every known use of nickel and its alloys.

W. H. Finkeldey has resigned his position as assistant chief of research of The New Jersey Zinc Company, with which

he has been connected for the past ten years, to become associated with the firm of Singmaster & Breyer, Consulting Chemical and Metallurgical Engineers, 420 Lexington Avenue, New York City. Mr. Finkeldey has specialized in the processes and problems of the galvanizing industry, the production of zinc base alloys, and the manufacture and uses of rolled zinc. His services will be available in these fields in his new connection.

Obituaries

HARLEY HOWARD HELLER

Harley Howard Heller, Works Manager of the Ford Instrument Company, Long Island City, N. Y., died at the Greenwich (Conn.) Hospital, August 28, 1927. He had been ill only a few days and his death was a great shock to his associates and to his many other friends.

He was born at Rochester, Pa., July 18, 1875. At the age of sixteen he left school and went to work as errand boy for the Mackintosch Hemphill Company, Pittsburg, Pa., where he learned the machinist trade at which he worked for some time at the Westinghouse Machine Company.

At the age of twenty-two Mr. Heller, realizing the value of a university training in his chosen profession, prepared for entering Engineering College at Cornell University by a year's intensive work at Geneva College and one summer school session at Ithaca. He was graduated from Cornell in 1903 with degree of Mechanical Engineer.

After graduation Mr. Heller went with the Henry B. Worthington Company manufacturers of steam pumps, New York City, and later worked with the Wheeler Condenser Company. Two years later he became superintendent of the Humphry's Manufacturing Company, makers of sanitary equipment and pumps, at Mansfield, Ohio. The following year he became superintendent of the Hill Clutch Company, manufacturing transmission equipment at Cleveland, Ohio. Two years later he was transferred to the New York Office of this company in charge of eastern sales.

In 1917 he joined the Ford Instrument Company as Works Manager, where for the past ten years his work has contributed in a large degree to the success of this company.

Mr. Heller was a member of the Masonic Fraternity and of a number of clubs and societies. On September 11, 1905, he married Lillian Purvis, Cornell A.B. 1904. He is survived by his wife, three brothers and three sisters.

FRANCIS P. BOLAND

Francis P. Boland, vice president of H. J. Astle and Company, Inc., Providence, R. I., died in Providence, June 16, 1927.

DAVID WILLIAMS

David Williams, formerly president of the David Williams Company, publishers of the Iron Age, died in October at his home at Rogers Rock, Lake George, N. Y. He was 85 years old. Mr. Williams was one of the leading publishers of trade periodicals in America. He had joined his father after graduation from Middletown Academy in 1857 in the publishing of the Iron Age, which his father, John Williams, had established two years before. Eleven lates later, David Williams was placed in control of the periodical.

Mr. Williams retired in 1909. He had been president of the American Trade Press Association and also president of the Federation of Trade Press Associations of the United States. He was a member of the Century and Grolier clubs; the National Arts Club; the Engineers' Club and the New York Historical Society.

D. H. ROBERTS

D. H. Roberts, founder of the Roberts Brass Company, one of the oldest manufacturing enterprises in Detroit, died at his home in Hendersonville, N. C., Monday night, October 24. The funeral was held at 2:30 o'clock on the following Friday at the Fort Street Congregational Church in Detroit.

Originally, Mr. Roberts was the founder of the McRae-Roberts Company but left that organization more than 20 years ago to found his own business.

Mr. Roberts was a member of several organizations, among them being the Detroit Athletic Club and the Board of Commerce. His burial was in Detroit.

HARRY L. BROWN

Harry L. Brown, secretary of the Ohio Brass Company, Mansfield, Ohio, and formerly editor of the Electric Railway Journal, died at Toledo, Ohio, on Oct. 23. Mr. Brown was stricken suddenly with appendicitis while returning from a football game and died shortly after an emergency operation had been performed.

NEWS OF THE INDUSTRY

Industrial and Financial Events

CABLE MERGER

A large electrical cable and wire company is being organized under the name General Cable Corporation. This corporation will embody the Dudlo Manufacturing Corporation, Fort Wayne, Ind.; Rome Wire Company, Rome, N. Y.; Safety Cable Company, New York; Standard Underground Cable Company, Pittsburgh, Pa., and the sheet, rod and wire mills of the Baltimore Copper Smelting and Rolling Company, Baltimore, Md.

The General Cable Corporation will have plants in Bayonne, Perth Amboy, Newark, and Harrison, N. J., Rome and Buffalo, N. Y., Pawtucket, R. I., Baltimore, Md., Chicago, Ill., Pittsburgh, Pa., St. Louis, Mo., Fort Wayne, Ind., Oakland, Calif., and Hamilton, Ontario.

A statement from the bankers underwriting this merger says that the net assets of the General Cable Corporation will be at least $50,000,000. The company will manufacture all kinds of copper wire and cable from the finest enameled wire to the largest and heaviest cable; also brass and bronze wire, tubing, copper rods and sheets. Particular emphasis will be laid upon research and development work. Executives and staffs will be retained.

The capitalization will consist of $16,000,000 first mortgage 5 per cent bonds, $15,000,000, 7% preferred stock; approximately 400,000 shares of class A stock and 440,000 shares of common stock.

Joseph W. Marsh, president of the Standard Underground Cable Company, will become chairman of the General Cable Corporation.

MACHINERY MERGER

The stockholders of the Farrel Foundry and Machine Company, Ansonia, Conn., and Buffalo, N. Y., and the Birmingham Iron Foundry, Derby, Conn., have voted to merge and thus bring together two of Connecticut's oldest and most important plants. The capital of the new company, to becalled the Farrel-Birmingham Company, will be $5,700,000. Officers are as follows: President, Charles F. Bliss; vice-presidents, F. D. Wanning, Walter Perry, Franklin Farrel, Jr.; secretary, George C. Bryant; assistant secretaries, Carl Hitchock, W. B. Marvin; treasurer, Alton Farrel; assistant treasurers, F. M. Drew, Jr., Donald G. Warner. The new company is one of the largest in the United States in the production of machinery for brass rolling mills and manufacturing plants.

DALLAS BRASS EXPANDS

The Dallas Brass & Copper Company has purchased 12 acres of land, running north and south between the Chicago, Milwaukee & St. Paul tracks and Grand Ave., at 6600 block. Switch tracks have been built on the east line of property and the company has just completed the first unit of its new plant, consisting of a modern casting shop equipped with electric furnaces and complete brass rolling and finishing mill for the manufacture of brass strips and sheets. The second unit (a copper rolling and finishing mill) is in process of construction. This plant is the only brass and copper rolling mill in Chicago and enables consumers of brass and copper strip to secure this metal locally instead of bringing it from eastern points. In addition, the company operates its Orleans St. plant, where it fabricates sheet and strip on draw presses, eyelet machines, etc., supplying semi-finished parts to other manufacturers. The Dallas Brass & Copper Company was organized in 1907 and this industry was founded here on the theory that Chicago consumers of brass and copper require a local source of supply for service and reduction of inventories.

UNITED CHROMIUM ELECTS OFFICERS

The first meeting of the board of directors of United Chromium, Incorporated, was held in New York City on October 5.

The following officers were elected: Frederick S. Wheeler, chairman of the board of directors; F. H. Hirschland, president; Andrew E. Baldwin, vice-president; John T. Pratt, Jr., secretary; F. M. Becket, treasurer; W. H. Billings, assistant treasurer.

Committees on Research, Patents and Protection of Patents were appointed by the president and an extensive plan for continued research and experimental work was outlined and approved by the board.

For the present, the offices of United Chromium, Inc., will be located at No. 30 East Forty-second St., New York City.

CHASE BRASS & COPPER OFFICERS

The Chase Brass & Copper Company, Inc., recently formed to handle the distribution of the products of the various subsidiaries of the Chase Companies, Inc., of Waterbury, has elected new officers.

President, F. S. Chase; vice-president and general sales manager, R. L. Coe; vice-presidents, J. R. Van Brunt and C. H. Krueger; treasurer, R. D. Ely; comptroller, W. A. Purdy; assistant comptroller, E. H. Madison; secretary, C. E. Hart, Jr.; assistant secretaries, G. C. St. John and Rodney Chase.

Messrs. Van Brunt, Krueger, Madison and St. John were officers of the Hungerford Brass & Copper Company., which was taken over by the Chase Companies a year ago.

GENERAL ELECTRIC EARNINGS RISE

General Electric Company sales billed for the first nine months of 1927, announced October 18 by President Gerard Swope, amounted to $225,959,610.89, compared with $229,638,216.24 for the corresponding period last year. Profit available for dividends on common stock for the nine months of 1927 was $33,262,241.20, compared with $30,051,619.77 for the same nine months of 1926. The profit available for common stock is equivalent to $4.61 per share in 1927 and $4.17 per share in 1927.

FRINK UNITES WITH STERLING BRONZE

Consolidation of the Frink Company, Inc., and the Sterling Bronze Company, both of New York, under the name of the Frink Corporation, to manufacture lighting fixtures and ornamental designs, has been announced. The combined companies have eighteen branches in the United States and eight foreign offices.

OAKITE SALES CONFERENCE

Oakite Service Men will hold their annual conference on industrial cleaning in New York, November 7 to 10, 1927, to discuss cleaning and related problems.

Oakite Products, Inc., completes its 19th year of industrial cleaning service when the field service men, technical staff and executives, comprising the organization, meet in the general offices in New York, November 7 to 10 inclusive. On this occasion the field representatives from 36 states and Canada discuss their problems and exchange experiences in connection with their work, which ranges from the cleaning of phonograph needles to locomotives, and silk shirts to submarines.

At this year's conference 16 different technical papers will be presented covering a wide range of subjects, among them being: "Some Newer Oakite Methods and Equipment for Railroads," "Developments in Cleaning Operations for the Oil Industry," "Handling Metal Cleaning and Rust Prevention Problems," "Cleaning Methods for the Baking Industry," "Oakite Materials and Methods in Meat Packing Plants," 'Oakite in the Dyehouse," "Oakite Materials in Automobile Service Stations," "Electroplating and Cleaning Methods," "Oakite in Hotels and Institutions," and others. Other papers deal with various cleaning and washing operations in dairies, bottling plants, laundries, hospitals, printing, electrotyping and lithographing plants.

ELECTRICAL AND INDUSTRIAL EXPOSITION

The Electrical and Industrial Exposition was held at Grand Central Palace, October 12-22, 1927. Its purpose was to give the public an opportunity to appreciate the scope and value of the electrical industry and to stimulate its growth. It showed how electricity had been brought to serve humanity through 25,000 devices.

Metals played probably the most important part in the products shown at this exposition. To enumerate all of the firms using metals in their products would be to list almost everyone who exhibited. The following list, however, will show some of the outstanding types of equipment and devices set before the public:

Vacuum cleaners
Lighting and wiring installations
Rferigerators
Washing machines
Ironing machines
Wires and cables
Percolators
Hot water heaters
Electric trucks
Heaters and radiators
Ventilating fans
Toasters
Electric stoves, chafing dishes, cooking devices
Lighting fixtures, floor lamps, etc.
Light and power installations
Flexible shafting
Electrical conduit installations
Control apparatus for furnaces, boilers, etc.
Radio sets
Electric ranges, curling irons, waffle irons, heating pads, baking ovens, etc.
Storage batteries
Electric clocks
Electrical testing methods
Elevators
Violet ray lamps
Floor polishers
Electric vibrators and beauty parlor devices
Moving picture machines
Flashlights
Sewing machines
Hoisting machines
Pumps
Radio broadcasting
U. S. Army—chemical warfare, coast artillery, signal corps

METAL EXHIBITS PROMINENT IN LONDON

Although the present is only the ninth of the series, the London Shipping, Engineering and Machinery Exposition becomes of age this year. The first exposition was held in 1906, and it now appears to have become an established biennial event in the engineering world. It has unique opportunities of representing the numerous industries concerned as fully as possible under existing conditions. The present display at Olympia, London's largest exposition hall, shows that good advantage has been made of these opportunities. A few of the most interesting exhibits are described hereunder.

Non-ferrous displays are not numerous, but they indicate a continuous and decided improvement in methods of manufacture corresponding with the ever-increasing use of these materials. One of the simplest yet most imposing displays has been made by the Yorkshire Copper Works and consists exclusively of solid-drawn tubes in copper and non-ferrous alloys. The copper tubes vary in diameter from 24 inches to 0.005 inches internal. Of the numerous alloys produced for various purposes the chief stress is laid on cupro-nickel, widely used for condenser tubes. Brass tubes are

also shown for beet and cane sugar plant, locomotive boiler tubes, in brass and copper, and light-gauge copper tubes, which are said to be cheaper in cost of installation than lead and sometimes even than iron for domestic purposes. A remarkable exhibit of monel metal is given on one stand and illustrates the application of this natural nickel-copper alloy to a great number of purposes, in which its strength and resistance to corrosion and high temperatures have proved to be of a value that seems to be constantly more recognized.

A comprehensive exhibit of various alloys and die-castings made in them appear on the stand of Fry's Metal Foundries. They consist largely of white bearing metals, supplied to constant specifications, and include aluminum alloys and chill-cast phosphor bronze. In particular the pressure-cast aluminum alloys have a remarkable lightness, strength and finish. The Hoyt Metal Company has a wide and interesting range of anti-friction white metal alloys for all services.—A. C. B.

JAMES H. McGRAW ADDRESSES EDITORS

"We who represent business publications pride ourselves on our ability to catch a big idea and put it across with a wallop, and I believe that the business papers of this city can do nothing better than to give their support to New York University in its effort to obtain adequate resources with which to carry on its great work in a still finer fashion," declared James H. McGraw, president of the McGraw-Hill Publishing Company, and dean of business publishers, in a speech at a luncheon of the editors and publishers of business papers held recently in the executive offices of R. H. Macy & Company at Herald Square, New York.

The host at the luncheon was Percy S. Straus, vice-president of the Macy Company and chairman of the executive committee of the Centennial Fund of New York University.

Mr. McGraw said, in part: "I have been inspired today, as I feel every man here has, by a great need. New York University is an institution that has served the community of which it is a part in a great way. Its resources have been limited; its facilities inadequate. To accomplish a service coincident with the vision of its administrators, New York University must have wider support. This is indeed a great need."

COPPER BANK VAULTS

Perfection of a new type of bank vault that is virtually immune to burglar attack through the use of copper in construction was announced November 1 by the Copper & Brass Research Association of New York. According to the association, exhaustive tests just completed show that the oxy-acetylene torch, recognized by safe experts as the most powerful instrument of vault attack, requires approximately two hours to penetrate a plate of pure copper seven inches thick.

In commenting on the significance of these tests, the association points out that a vault burglar would require about six hours of uninterrupted effort with the oxy-acetylene torch to penetrate a modern vault door twenty inches thick, containing a twelve-inch plate of pure copper.

"The high resistance of copper to torch attack is explained by the fact that this metal is a rapid conductor of heat, in contrast with other metals of low heat conductivity heretofore used in vault construction. A torch capable of developing a heat between 5,000 and 6,000 degrees Fahrenheit will penetrate the first few inches of a copper plate in a comparatively short time. However, the flame loses its efficiency as the copper conducts the heat rapidly away before the entire body of the metal can be raised to a fusing point, and the torch becomes ineffective."

LIGHTING EXHIBIT

The second annual exhibit was given by the Associated Industries of Massachusetts, in which the Edison Electric Illuminating Company of Boston had a booth illustrating various applications of electric heat, light and power in the industries.

In conjunction with the exhibit of quality products there was a demonstration and lecture on "Correct Illumination in Industry," held in the Rogers Building, Boylston St., Boston, on Wednesday, October 19, at 3:30 P.M. and 4:30 P.M. The lecture was given by J. Daniels, vice-president of the Illuminating Engineering Society.

ZINC COATED IRON CONTEST

The Sheet Steel Trade Extension Committee has offered prizes for the best and most representative samples of blistered paint on galvanized (zinc coated) sheet iron in order to further its investigation into the causes and prevention of blistering. For the 50 most satisfactory samples received, $14 each will be paid. In addition, four prizes, namely, $100, $75, $50, $25 will be paid for the best information and picture accompanying these specimens.

Detailed information can be obtained from the Sheet Steel Trade Extension Committee, Oliver Building, Pittsburgh, Pa.

ARTIFICIAL GOLD

An alloy resembling gold, and declared to be just as durable, has been produced by a Bohemian inventor, Joseph Benovics, according to reports. The new metal composition looks like gold, of a rich yellow color, does not oxide and is much heavier than iron.

The inventor is now negotiating with a German company, whose representative is enthusiastic on the discovery. The expert conducting the investigations says that the alloy truly deserves the name of artificial gold. The composition will be kept a secret until the invention is sold.

NEW SOLDER SUBSTITUTE

Recent activity in the stock of the American Machine and Foundry Company has been accompanied by reports that the company is preparing to introduce a new alloy to take the place of solder.

Officials of the company are keeping their plans closely guarded, but it was reported that engineers have perfected the new product, to be known as Amaloy. One of its advantages is said to be that it is cheaper than present soldering materials.

GOLD KEEPS INDIA POOR

According to a study submitted to the U. S. Department of Commerce, $5,000,000,000 worth of gold and silver is locked up in India in temple decorations, jewelled ornaments, bars of bullion, bangles, necklaces and American ten-dollar gold eagles used for personal adornment. This "frozen wealth" yields no return to its owners and cannot be used for credit to carry on commerce. This, it is stated, is one of the causes of the slow development of Indian trade.

INCORPORATIONS

The **Thompson-Owens Corporation**, Toledo, Ohio, has recently been incorporated for the manufacture of finished bronze bushings and bearings, brass and bronze castings. A modern plant, including foundry, located on the Toledo Terminal Railroad, has been acquired. The personnel of the new company includes George Thompson, president and general manager; J. E. Owens, secretary-treasurer and sales manager. Both these men were formerly connected with the Bunting Brass and Bronze Company. This firm will operate the following departments: Brass, bronze foundry; brass machine shop, tool room.

BUSINESS TROUBLES

The **Globe Art Manufacturing Company**, Newark, N. J., will be sold by Lionel P. Kristeller, receiver, 810 Broad Street, Newark. The property consists of a plant adapted for the manufacture of phonograph parts and brass novelties.

The plant of the **Magee Furnace Company** in Taunton, Mass., has been placed on the market by the Willard Welsh Realty Company, Inc., 209 Washington St., Boston, Mass. This plant, it is said, is so constructed and arranged that the buildings can be used for other purposes. The total floor space is about 143,000 square feet. The land area is about 16 acres. The plant includes office buildings and mounting shop; mounting shop addition; machine shop; foundry; foundry addition; repair shop; sand room; core room and wash room; pattern storage; carpenter shop; shipping room.

Business Reports of The Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

NOVEMBER 1, 1927

If there was any recession in business during July and August in Waterbury, it has now passed inasmuch as the Chamber of Comerce report for the month of September shows that the number of employees in the eight largest factories to be 18,340, a gain of nearly 400 over the August figures and a gain of nearly 500 over the July figures. It is also a gain of more than 100 over the figures for September, 1926, which is considered of unusual import as last year was admitted to be the most prosperous year since the war and doubt was expressed if the business this year would reach that figure.

Separation of the **Novelty Manufacturing Company** of this city from the **Risdon Manufacturing Company** whose main plant is in Naugatuck was effected during the past month. **C. E. Beardsley,** president of the Risdon Company, has formed a new concern kown as the **Beardsley Manufacturing Company,** which has bought the local plant formerly known as the Novelty Manufacturing Company from the Risdon Company. Operations of the local plant are now being carried on under the name of the Beardsley Manufacturing Company. Whether or not Mr. Beardsley will continue as president of the Risdon Company is not known.

C. E. Beardsley was last month granted a patent for the design of a smokers' stand and assigned the rights to the **Risdon Manufacturing Company. P. F. Warner** and **Paul E. Fenton** were granted a patent on a double-pin socket and assigned it to the **Scovill Manufacturing Company.**

The local Y. M. C. A. has received a check of $10,000 from the estate of the late **Charles F. Brooker,** former **American Brass Company** head. This is in accordance with his will. The sum is to be held as a trust fund the income only to be used as the local institution sees fit.

Walker Matteson, secretary of the local Chamber of Commerce, has resigned to return to his private business. **Harry B. Dow,** assistant secretary of the **Waterbury Clock Company,** and president of the local Chamber, together with a committee of five of the directors of the Chamber are now making a survey to select a successor to Mr. Matteson.

Walter A. Jarvis was elected president of the **Chase Foremen's Association** at its annual meeting held last month. The other officers elected are: Vice-president, **Edward S. White;** secretary, **T. J. Shea;** treasurer, **Walter Jaeger;** directors, **John Phelan, Charles E. Webber** and **Victor Hedberg;** auditing committee, **John Phelan** and **Aaron Pomeranz.** The club voted to procure a suitable site for a clubhouse on the city outskirts where boating and fishing would be available.—W. R. B.

BRIDGEPORT, CONN.

NOVEMBER 1, 1927

The government labor department for Bridgeport for last month reports that "the slight surplus of workers that existed here during July and August was greatly reduced during September and is now practically wiped out. All plants are running, the majority on full time. Enough building is under way to keep all resident artisans busy."

Buildings and property of the **Columbia Nut & Bolt Company** on Railroad Avenue were sold last month at public auction to **A. G. Leake** of the **Leake & Nelson Company** for $25,000. No announcement was made regarding the future plans of the buyers. The property belonged to ex-Mayor **Fred Atwater,** president of the Columbia Nut & Bolt Company. The factory was closed in order to cut down overhead costs, Mr. Atwater stated. The other factory of the company in Milford will continue to operate as usual, he said. The property sold is roughly 240 by 150 feet and contains six buildings, the largest being two stories, 50 by 500 feet and the others one-story buildings.

The creditors of the **Rogers Silver Plate Company** of Danbury, meeting in this city, have agreed upon **John McCarthy** of Danbury as trustee of the company. Assets are $6,234 and liabilities, $47,970.—W. R. B.

CONNECTICUT NOTES

NOVEMBER 1, 1927

HARTFORD.—Actual merger of the **Arrow Electric Company** and the **Hart & Hegeman Manufacturing Company,** announced two months ago, took place last month. The new company is called the **Arrow-Hart & Hegeman, Inc.,** is capitalized at $2,000,000 and is said to be the largest concern in the state manufacturing electric wiring, switches and electric wiring devices.

Edward R. Grier, president and manager of the Arrow Company, has been named president and a director of the new concern. **Samuel P. Williams,** president of the Hart & Hegeman Company, has been named first vice president, treasurer and a director; **Benjamin C. Perkins,** secretary, assistant treasurer and a director of the Arrow concern, has been named a vice president, secretary and director of the new concern, **Monroe Guett,** vice president of the Hart & Hegeman Company, has been named a vice president. The offering of 31,740 shares which was offered to the public out of the 200,000 authorized shares was quickly absorbed at $30 a share, although the par value is only $10.

Spencer Turbine Company is filling several large contracts in New York City and in South Africa and New Zealand, according to its president, **Ira H. Spencer.** He says the company will do a total net business for the year of $1,500,000, a considerable increase over that of last year.

Warren J. Belcher, engineer and manager of the **Whitney Manufacturing Company,** has been granted a patent which he assigned to his company, on a new power transmission chain.

The **Pratt & Whitney Aircraft Corporation,** has completed negotiations with the Navy Department for the manufacture of 346 Wasp engines and spare parts, at a price approximating $3,000,000.

The Labor Department report for Hartford last month shows all plants operating, practically all on full time with a few on a 45 hour week basis. A shortage of tool and die makers exists in the metal working trades.

BRISTOL.—Lucy T. Mink of this city, who loaned the **Bristol Manufacturing Co.,** $100,000 is a preferred stockholder and not a creditor, Judge Newell Jennings held in the Superior Court. By this decision Mrs. Mink will receive the balance of $25,000 due on her claim against the company, payable upon receipt by the receiver of $55,000 for the sale of the company's property in Plainville. The company became financially embarrassed in November, 1922, and negotiated the loan with Mrs. Mink then. It went into receivership in July, 1923. It was started in 1850. The claims of the preferred stockholders and creditors will be paid in full but the common stockholders will receive nothing.

NEW BRITAIN.—Practically all plants are running on fairly satisfactory schedules according to the Department of Labor report for last month. There is, however, a surplus of unskilled labor with little demand for this class of help.

Arvid H. Nero of this city has been granted a patent on an electric switch. **Merwin S. Vile** of this city has been granted a patent on a hanger box.

TORRINGTON.—The labor supply and the demand here are well balanced. All plants are operating and there is little if any unemployment evident. Building is underway but is chiefly of residential construction although there is some little factory building.

Patrick J. Fitzgerald of this city has been granted a patent on an armature which he has assigned to the **Fitzgerald Manufacturing Company.**

TERRYVILLE.—The **Eagle Lock Company,** has started working on a curtailed schedule of eight hours a day, five days a week. Several departments have been working on reduced schedules for the past few months but until now most of them have maintained the regular schedule of 55 hours a week. The company employs about 1,400 people. About 1,200 are affected by the new schedule as the shipping department and machine room are not affected by the curtail-

ment. Work will be started at 7.30 and cease at 4.30 under the new schedule.

DERBY, ANSONIA, SEYMOUR and **SHELTON.**—Part time operations obtain in the brass and manufacturing plants, creating a slight surplus of workers, only part of whom can secure local employment. A plush mill is closed, affecting 90 employes. The foundries here, such as the Ansonia **Farrell Foundry** and the **Birmingham Iron Works** are working overtime.

Patrick McKeon of Shelton has been granted a patent on a metal cigarette case.

The merger of the **Farrell Foundry** of Ansonia and the **Birmingham Iron Works,** reported two months ago has now been actually effected. The new concern is called the **Farrell Birmingham Company.** The officers include all the former officials of the two companies and are as follows: President, **Charles F. Bliss;** vice presidents, **F. D. Wannings, Walter Berry** and **Franklin Farrell, Jr.,** secretary, **George C.** Bryant; assistant secretaries, **Carl Hitchcock** and **W. B. Marvin**; treasurer, **Alton Farrell**; assistant treasurers, **F. M. Drew,** Jr., and **Donald G. Warner.**

MERIDEN.—The **International Silver Company** of this city with plants in Wallingford, Waterbury, and Bridgeport, is now in its best business period of the year and the earnings are in excess of those for 1926. For the first half, the company netted a sum after interest, depreciation and taxes, equal to $7.05 a share or more than a full year's dividend requirements on the common stock out. For the full year of 1926 the net earnings amounted to $17.24 a share. There is a rumor that the stock will be split but it lacks confirmation.

Among local patents granted during the month are the following: **Julius Ross** and **E. A. Schuelke,** vanity box; **Herman Wolter,** lantern and combined lighting fixture ring and support.—W. R. B.

MIDDLE ATLANTIC STATES

TRENTON, N. J.

NOVEMBER 1, 1927

Stockholders and creditors of the **Mohme Aero Engineering Corporation,** which has a plant at Monmouth Junction, N. J., have asked in a bill filled in the Court of Chancery for the appointment of a receiver to take over the affairs of the concern. The corporation was organized last April and has lately been devoting its efforts, according to the bill, to the construction of an airplane, which crashed when the initial flight was attempted. Other planes were under construction at the time. Business of the corporation has since been suspended.

The **Jordan L. Mott Company** is running five days a week at this time. Some time ago Federal Judge Rellstab signed a decree in which he ordered foreclosed a $2,000,000 mortgage held upon the property by the **Guaranty Trust Company of New York.** This action was to have taken place some time ago, but has not been put into effect yet. In the meantime an effort is being made to reorganize, pay off the mortgage and keep the plant in operation.

Hudson Smelting and Refining Company, of Newark, was incorporated with $50,000 preferred and 2,500 shares common to engage in the smelting and refining business. **James W. Paterson,** Arlington, **J. Sterling Place** and **Emil A. Schroth,** East Orange, N. J., are the incorporators. Other incorporations were: **Miller Screen Company, Inc.,** manufacture screens, $100,000, Paterson, N. J.; **Ace Foundry Company,** operate brass foundry, $100,000, Perth Amboy, N. J.; **Treat Safety Razor Corporation,** 250 shares no par, Morristown, New Jersey.

A jury in the Federal District Court at Trenton returned a verdict awarding damages of $15,700 to the **Cornine-Hakinson Die Casting Company,** of New York, against the **Pipe and Tube Bending Company,** of Newark. The defendant was charged with breach of contract for vending machines. The case was tried before Judge Bodine.—C. A. L.

NEWARK, N. J.

NOVEMBER 1, 1927

Six suits have been filed by two western spark plug manufacturing companies against three New Jersey firms alleged to be rehabilitating old plugs and selling them as new. Thousands of spark plugs were seized at the plant of the firms against which suits were filed by each of the complainants. At the plant of the **Lyndhurst Spark Plug Salvage Company,** 15,000 plugs were removed. The **Champion Spark Plug,** of Toledo, Ohio, and the **A. C. Spark Plug Company,** of Flint, Mich., a subsidiary of the **General Motors Corporation** are the complainants in the suits. Both charge the New Jersey concerns have altered and rehabilitated worn out spark plugs manufactured by the complainants and have sold them as new under the original trade marks. Thirty thousand plugs were seized at the offices of the Newark firms. Counsel for the General Motors Company declared they would ask the United States District Court to appoint a special master to determine the damages, which, they say, will total more than $200,000.

The following concerns were chartered at Newark; **Tri-Chemical Company,** chemicals, $100,000; **General Chemical Products Company,** chemicals, 100 shares no par; **A. J. Hastings Saw and Knife Company,** cutlery and tools, $100,000; **All Metal Products Company,** metal products, $100,000; **Curtice Manufacturing Company,** mechanical devices, $100,000; **Mulberry Metal Stamping Works,** manufacture stamps, $10,000; **Rex Jewelry Manufacturing Company,** jewelry, $125,000.—C. A. L.

MIDDLE WESTERN STATES

TOLEDO, OHIO

NOVEMBER 1, 1927

The newly-organized **Thompson-Owens Corporation** went into production in Toledo about November 1. It is producing bronze bushings and bearings, brass and bronze castings. The plant, with every modern requirement for this kind of work, is located on the Toledo Terminal Railroad. The president and general manager is **George Thompson.** For the last ten years he was with the **Bunting Brass & Bronze Company** as general superintendent and works manager. **J. E. Owens,** secretary-treasurer and sales manager, also was formerly connected with the Bunting Brass organization as salesmanager.—F. J. H.

DETROIT, MICH.

NOVEMBER 1, 1927

It is announced that a greatly increased use of the electric welding process is being resorted to in the construction of the new Ford motor car. Model T in its last stages of construction this year contained 212 welded parts in which more than 400 spot and butt welding machines were used. In the new Ford Car, it is stated, the number of welded parts have been increased to more than 400 while the number of machines used in making them have been increased to more than 600. Ten years ago there was hardly a welded part in the Ford car and not more than three welding machines in the entire Ford industries. Five years ago the welding department worked 18 months to develop a certain new welding operation and put it on a production basis. Within the last 12 months the department, applying its cumulative experience, has solved at least 30 problems more difficult than that on which it once spent a year and a half.

The demand for brass ingot is somewhat backward in the Detroit district at present. Foundries are beginning to curtail operations to some extent due to lessening production in the motor car industry and this let-up is being reflected in ingot orders, it is state. Consumers are buying only in

sufficient quantities to meet actual requirements and stocks of metals on hand are comparatively small as a result, it is stated. Competition for business is keen and some price shading is reported. With the motor car manufacturers planning on further production curtailment and with inventories scheduled for the near future, the outlook in the ingot market is somewhat uncertain.

Announcement is made that the original founders have taken over the business and active management of the **Super-Arc Welding & Body Company** at 17 East Bethune avenue. This highly specialized business will be operated, it is stated, to a still bigger super-arc service. The organization has a completely equipped plant of 12,000 square feet. The officers are president, Edward A. Scheu; vice-president, Harry E. Bradford; treasurer, Joseph P. Kryza; secretary, Andre A. Anthony.—F. J. H.

MILWAUKEE, WIS.

NOVEMBER 1, 1927

There is a tendency to overlook the new metal market and go into old metals at present among Milwaukee manufacturers. Chicago has always been a good market for old metals but this tendency is recent in Milwaukee. This is surprising as the difference between the old and new metals after refining, is not very great. The yards along side of the **Standard Brass Works, Milwaukee,** are filled with new shipments of scrap. The **National Lead Company** also is taking up a lot of lead scrap. The same is the case with the **Milwaukee Lead Company.**

Inquiries at the various plants show that business is at about the same stand as last month, with a slight tendency to hesitate until the time when orders will be booked for future delivery. There was a considerable number of these made but it seems that more are expected to fill up the schedule of the plants for the entire winter.

Considerable improvement in the appearance of Manitowoc's industrial section will be made by the **Aluminum Goods Manufacturing Company,** which has acquired the vacant lot northeast of the plant. A crew of men is already at work leveling off the property and preparing it as a location for two houses which will be moved off another part of the company's property. Additional reclaimed land will be converted into a parking space for cars belonging to employees.

The **Burlington Metal Corporation,** of Burlington, Wis., has been organized by **Lowell S. Slag, Lois M. Kennedy** and **Evelyn Chapman.** They will operate a foundry machine shop and a plating plant for brass, bronze and iron fixtures.

The **Chicago Hardware Foundry Company,** who manufacture aluminum, brass, bronze and gray iron castings of all kinds, are making some land improvements in their North Chicago plant. Their plant at 546 W. Washington blvd., Chicago, is being pressed with orders mostly contract work for future delivery.

The **Baldwin Brass Works** of Chicago, manufacturers of brass and bronze railings, have received some important orders for theatre buildings.

The **Slyker** metal radiator furniture is on display at the Milwaukee Food Show being held at the Milwaukee Auditorium. This furniture, made in brass, bronze and wrought iron, is not only decorative, hiding the unsightly radiators, but it is also a means of preventing the soiling of draperies and costly decorations.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

OCTOBER 17, 1927

The copper tube trade of Birmingham is taking the lead in the trade revival which is gradually extending to many industries. One firm has orders for the tubes for six motor boats. Very good contracts have been placed by the railways and the manufacture of copper tubes for domestic water conveyance is going forward by leaps and bounds. The shipbuilding revival has brought a good deal of business, some firms finding it necessary to work overtime. The orders in hand exceed anything experienced during the last five or six years.

The manufacturers of miscellaneous brassware such as door handles, knobs and ornamental fitments are very busy in supplying orders for shipbuilders. This business is rapidly expanding and it is found that foreign competition is negligible. The rapid fall in the price of tin is embarassing to manufacturers who use this metal as an alloy for gun metal and it is possible that price changes may take place shortly. Copper is believed to be at the minimum price but advances are looked for shortly as the demand at last has overtaken the supply. The shortage is understood to be chiefly due to some trouble which the smelters are having with their furnaces. One of the busiest trades in Birmingham is the manufacture of nickel goods. The firm of **Henry Wiggin and Company** is making extensive enlargements of its plant to deal with its growing business. This firm is allied with the **Mond Nickel Company** and obtains its supplies from Canada which it is understood furnishes about 90 per cent of the nickel used in this country.

The makers of lamps are very fairly active but somewhat curiously railway lamps are an exception. Business in this line comes almost entirely from South American Railways, the home lines not having yet entered the field. The railways are buying very well in other goods and it is assumed that they will place good orders shortly for railway lamps of various descriptions.

The season's demand for autumn and winter goods has commenced, very good sales having been made of oil stoves, lamps and a variety of brass articles of a decorative and useful character in the way of household fitments.

A very favorable change has come over the domestic aluminium industry. A few years ago the Birmingham makers were almost hopelessly beaten by German competition. Now that the makers have produced an article of medium weight and quality German aluminium ware has very nearly disappeared.

The usual autumn activity has commenced in the jewelry trade and many of the firms are working overtime. Business in cheap jewelry is expanding and it is remarkable that the great stores selling goods at 3d and 6d each are able to get their wares from Birmingham manufacturers. There is an improved demand for high class gold and fancy silver jewelry.

There is a steady demand for silver ware and good quality electro plate although the output is considerably below what is regarded as normal for the period of the year. Stocks are very low and this business is expected to buy on an expanding scale. Very useful orders are coming in from shipbuilders and hotel proprietors who have for a long time been buying the barest necessaries.—J. H.

Business Items—Verified

Marine Brass Works, Wilmington, Calif., manufacturers of brass and bronze castings have completed the installation of a new melting furnace.

The **Hill Clutch Machine and Foundry Company,** Cleveland, Ohio, has opened a Metropolitan District office at 30 Church Street, New York, in charge of Charles C. Phelps, sales engineer.

The **National Lead Battery Company,** 1728 Roblyn Avenue, St. Paul, Minn., manufacturer of electric storage batteries, etc., has recently erected a building at North Bergen, N. J., costing $110,000. This firm operates a stamping department.

The **Belden Manufacturing Company,** 2300 Western Avenue, Chicago, Ill., manufacturer of electric wire and cables, magnet wire, etc., has tentative plans under way for an addition to its plant at Richmond, Ind., to cost in excess of $50,000 with equipment.

Brown Plating Supply Company, Inc., Boston, Mass., has moved from its old location to new and larger quarters at 101

Haverhill street, Boston, where they will carry a complete line of new and used plating, polishing and buffing supplies and equipment.

The **Federal Brass Manufacturing Company,** Marysville, Ohio, due to increased business, is erecting an addition to their plant. This firm operates the following departments: brass, aluminum foundry; brass machine shop, tool room, cutting-up shop, plating, polishing, grinding room.

The **Artcraft Metal Products Company** recently installed in its new plant at Martin's Ferry, Ohio, a complete porcelain enameling department. Installation was made by the Ferro Enamel Supply Company, of Cleveland, Ohio. The Artcraft plant was recently moved from Columbus, Ohio, to Martin's Ferry.

A. Weiskittel and Son Company, Lombard and 12th Streets, Baltimore, Md., will build a one-story addition to plant for the manufacture of stoves, furnaces, enamelware, etc. Estimated cost $100,000. This firm operates the following departments: brass foundry, tool room, plating, japanning, stamping, grinding room.

The Colman Lamp and Stove Company, Wichita, Kans., is erecting one-story, 320x400 ft. plant at West 65th Street, and S. Laramie Avenue, Chicago, Ill. Estimated cost $350,000. This firm operates the following departments: tool room, cutting-up shop, japanning, stamping, soldering, lacquering, grinding room.

Indiana Smelting and Refining Company, Indianapolis, Ind., announces that an erroneous report was sent out concerning the destruction by fire of their entire plant. The fact is that due to some sparks from a furnace a small hole was burned in the roof of a building which caused damage to the extent of less than $100.

The Belke Manufacturing Company, Chicago, Ill., has exported four salt spray tests apparatus units to Europe within the last month. They were bought by Charles Churchill Company, London, England; George Goodman, Ltd., Birmingham, England; L. M. Ericcson, Stockholm, Sweden; Lanbeing Pfanhauser Works, Leipzig, Germany.

The **Battery Equipment and Supply Company,** 1640 S. Wabash Avenue, Chicago, Ill., has let contract for a new one and two-story plant to cost in excess of $100,000 with equipment. A. A. Schwartz, 720 No. Michigan Avenue, is architect. This firm operates the following departments: tool room, plating, japanning, stamping, soldering, polishing, lacquering, grinding room.

National Machinery Company, Tiffin, Ohio, and the **Chambersburg Engineering Company,** Chambersburg, Pa., have combined their sales and service force for the distribution of their forging equipment. Manufacturing units and the engineering departments have not been combined but continue to operate as before. Chambersburg-National Sales Offices are now located in New York, Detroit and Chicago.

The **Berger Manufacturing Company,** Beldon Avenue, Canton, Ohio, manufacturer of safes, lockers, etc., has awarded a general contract for rebuilding the portion of its plant recently destroyed by fire. The new unit will be one-story and cost approximately $80,000 with equipment. This firm operates the following departments: smelting and refining, rolling mill, zincing, stamping, polishing.

The **Boyertown Burial Casket Company,** Boyertown, Pa., manufacturer of bronze burial cases, etc., has acquired property at 342 Central Avenue, Newark, N. J., comprising a four-story mill type structure, totaling 60,000 sq. ft. of floor space, and will remodel for a new factory branch and distributing plant.

The **Paasche Airbrush Company,** Chicago, Illinois, announces the opening of a Sales and Service Branch at Cincinnati, Ohio, under the direction of H. H. Evers, manager. This branch will be known at the Paasche Airbrush Company of Cincinnati and will be located at Wade Street, Flint Street and Southern Railroad. A complete stock of the Paasche air devices, including portable painters, airbrushes, etc., will be maintained at the Cincinnati office.

The **Precision Scientific Company,** Arthington and Tripp Avenues, Chicago, Ill., manufacturer of precision instruments and equipment, has leased a two-story factory to be erected by the Regan Construction Company, 125x200 ft. to cost $95,000, and will take possession as soon as completed. The present business will be removed to the new location and additional equipment provided for increase in capacity. This firm operates the following departments: brass machine shop, tool room, spinning, japanning, stamping, tinning, polishing, lacquering.

The **Lincoln Electric Company,** manufacturers of "Line-Weld" motors and "Stable-Arc" welders, announces the appointment of E. A. Thornwell of Atlanta, Georgia, as representative for Georgia, and Eastern Tennessee. Mr. Thornwell has been actively associated with the electric industry in Atlanta, Georgia, and Pittsburgh, Pennsylvania, since his graduation in 1904 from Clemson College, South Carolina. John Van Horn, Factory Engineer for The Lincoln Electric Company, has been attached to the Atlanta office to assist Mr. Thornwell.

The **Advance Pattern and Foundry Company,** 2734 West 36th Place, Chicago, Ill., has acquired land, 600x125 ft., the major portion of which will be covered by a building, approximately one-half of which is to consist of a one-story foundry building; the other half a two-story building to accommodate polishing, assembling, and shipping departments. This building will be utilized entirely for the purpose of manufacturing Super Maid cook ware. Additional polishing and foundry equipment will be required.

The **Ferro Enameling Company,** of Cleveland, Ohio, will start its next Enamelers' Training Course on December 5th and course will last two weeks. Twenty-one sessions will be held during the two weeks, in a special class room newly equipped by the Ferro Enameling Company, supplemented by actual work in the shop. The course covers all phases of porcelain enameling and is considered a tabloid University Course. J. E. Hansen will conduct all classes and prepare the lessons. Only a limited number of students can be accepted for each course.

The **Hobbs Electro Plating Company,** 37 Perkins St., Bangor, Maine, was organized and opened for business October first. They have installed new and up-to-date equipment and are able to handle all classes of metal finishing. The proprietors are F. W. Hobbs and F. E. Crymble, Jr. Mr. Hobbs was formerly foreman plater of the Crogan Manufacturing Company of Bangor, and previously with Wood and Bishop Company of Bangor. He is well known to the readers of The Metal Industry through the articles which he has contributed. He will give personal attention to all work.

A change in the management of the **International Chromium Plating Corporation** of 36 Garnet Street, Providence, R. I., is announced, effective October 15, 1927. Joseph A. Fogarty, who has been with the corporation since its operation in the capacity of sales manager, is promoted to general manager and Thomas B. Hoyt, Jr., formerly with Beardslee Chandelier Manufacturing Company and the Beverly Light Corporation, who joined the concern several months ago, is advanced to plant manager. The corporation announces increased facilities in the jewelry plating department to meet the intense demand from this industry for chromium plating. Originally their service included hardware, plumbing supplies and large and small commercial pieces, which they will continue to accept.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	96	97
American Hardware Corporation	$100	79	82
Anaconda Copper	50	48⅜	48⅝
Bristol Brass	25	8	10
International Nickel, com.	25	68¼	68¾
International Nickel, pfd.	100	108	110
International Silver, com.	100	191	192
International Silver, pfd.	100	125	126
National Enameling & Stamping	100	25¾	26½
National Enameling & Stamping, pfd.	100	90	92
National Lead Company, com.	100	117	118
National Lead Company, pfd.	100	112	113
New Jersey Zinc	100	182	184
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company	..	56	58
Yale & Towne Mfg. Company	..	77	77½

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

NOVEMBER 1, 1927

The trade in brass and copper fabricated materials has been quiet during October and conditions are practically the same as those which have obtained in the past few months. Business from day to day is sufficient to provide for a reasonable production in the mills, but without volume enough to keep all departments on full time. It is observed, however, that the industry is in about the same position as that which prevails in steel and other basic industries throughout the country. Although the competition is intense for such business as is offered, and prices have accordingly been effected to some extent, there is very little disposition to take business without profits, and from this angle a fair degree of satisfaction is felt.

There is some change in the views that are held as to the future, compared with those which prevailed a few months ago. At that time there was much optimism expressed about the fall and winter months. This very desirable condition has not developed, and optimism has been correspondingly dampened. It has given way to the conservative view that trade will continue in somewhat less volume in the closing months of the year. This view, however, is subject to very quick revision, and with the first influx of inquiries in any volume, the restoration of optimism is likely, for the tendency is definitely toward hopefulness, and an atmosphere of depression will be allowed to exist only if business gets into such a condition that no other feeling is possible.

There has been an unusually good demand for nickel and nickel copper alloys. Expansion of trade has been large in the textile, chemical and dairy industries and they have all played a conspicuous part in the consumption of Monel metal, which has now become a standard metal for equipment in those industries, as well as in the hotel and restaurant field. Several months ago one of the large producers of caustic soda installed a complete set of evaporators made entirely of seamless nickel tubes and tube plates, and this lead was followed during October by another very large manufacturer who has duplicated the installation. In both instances steel was displaced by nickel at a heavy increase in first cost, the initial expense being about 20 times that of steel. However, in terms of long service, and upkeep, the nickel is figured to be extremely economical.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON, D. Houston & Company, Metal Brokers, New York

COPPER

NOVEMBER 1, 1927

New demand in the local market for copper moved along at a moderate rate last month, with some spasmodic heavy buying for domestic account. There were intervals of hesitation and light trading, but despite a contraction of interest in consuming circles prices held up remarkably well. Large export buying was a recent feature, and the heavy movement into foreign channels of consumption had a favorable influence on the market situation. There was a substantial advance in standard copper in London during the first half of October, but it was disappointing to find that the domestic market made little headway in developing anything akin to vigorous strength.

The statistical position shows an improved trend in copper. Producers are not embarrassed with a growing surplusage of supplies. On the contrary, there was a decrease of 14,322,000 pounds in stocks of refined during September, compared with the figures for the previous month. Refined stocks on October 1 amounted to only 172,986,000 pounds, as against 210,802,000 pounds on March 18, a reduction in several months of 37,816,000 pounds. Total shipments of refined metal in September amounted to 252,522,000 pounds. Output from refineries for that month was 238,200,000 pounds. These statistics accentuate the excellent features of the situation from the standpoint of supply and demand. But the action of the market falls short of reflecting the strength of the technical position. Current movements warrant consistent market firmness. Market closed firm at 13¼c domestic and 13.60c foreign ports. Large export demand.

ZINC

A sagging market for zinc was the feature lately. There was an active demand in the first half of October, but the market turned weak in the second half and went into new low ground for extreme movements. Considering the fact that the average East St. Louis. Zinc ores have sold at $38 per ton, and supplies have been abundant on this basis. Consumers showed decided interest when the price of slab zinc touched 6 cents. Substantial sales were made at this level both for prompt and future deliveries. But when further price weakness developed buyers became shy in expectation of still lower figures. Mine output and smelter production continue large, and the reduction of 310 tons in surplus stocks in September did not prevent the market declining. Stocks in smelter's hands on October 1 amounted to 34,277 tons, against 15,699 tons on October 1, 1926. The market is reaching a point, however, where a rally may be expected, and consumers are undoubtedly watching the favorable opportunity to purchase.

TIN

Erratic market conditions were conspicuous features in tin during October as prices moved up and down the scale according to the quality of trade sentiment. Rallies and reactions followed one another in rapid succession, while various factors kept the market in a state of uncertainty and unsettlement. Early in the month the market was active and firm at 59⅛c for Straits tin. Subsequent weakness developed in London and domestic prices receded to 57⅞c for prompt delivery here and to £268 15s 0d in London. The London market was £275 5s 0d on October 4. There were sharp local and foreign fluctuations during the second half of the month, with the trend so uncertain as to make both consumers and dealers cautious. Production of tin is on the increase, and this fact leads to expectations of lower prices. American deliveries for the first nine months of this year amounted to 56,290 tons, against 59,450 tons for the corresponding months last year. If supplies continue to increase the market will be compelled to adjust itself to that condition. Violent fluctuations are hurtful to industry, but any price above 50 cents for tin provides the occasion for extreme movements. Considering the fact that the average price of Straits tin for the last 30 years was 39.81c, the prevailing market is obviously in a vulnerable position. At close of month the price was steady at 57¼c to 57¾c for spot Straits and 57¼c to 57.45c for December delivery.

LEAD

A remarkably steady market prevailed here the last several weeks, with no change in the official price of 6¼c New York. Prices in the East St. Louis district are quoted generally 6c per pound, though some business was reported at 5.95c. Consumers were recent purchasers on a fair scale, and a satisfactory domestic outlet was noted. The depressed London market has exerted an

unfavorable influence on prices, and recent weakness abroad prevents a rally here. Stocks in Europe are believed to be heavy, and curtailment in production appears to be necessary to improve the situation. Conditions in world markets have tended to bring about present low prices, but with a reduction of lead stocks amounting to 5,968 tons in September and a decrease of 7,483 tons in output during that month, the situation might readily be capable of improvement in the near future provided business is maintained at the present rate.

ALUMINUM

Prices of alumnium were reduced 1c per pound during the last half of October due largely to curtailed consumption by motor car manufacturers. The leading domestic producers are sellers of ingot aluminum at 25 cents for commercial grade of 99% plus and 24 cents for metallurgical 94-99% ingots. The new sales basis has not increased the buying movement thus far to an important scale. Requirements have fallen off and consumers appear to confine purchases to immediate necessities. The outside market has been obliged to follow the decline in price, and a reflection of the weakened condition is apparent by offerings of foreign metal at 24.30c per pound. A new price basis has also been established for aluminum sheets and coils, with a general reduction of 2½c per pound on sheets and 1½c on coils. Large quantities of aluminum have been brought into this country from Canada to be fabricated and reexported.

ANTIMONY

Consuming demand for antimony was in fair volume, which led to some improvement in prices. The spot price at the beginning and end of October was practically the same at 10⅞c duty paid. For a short time the market rose to 11⅜c on stronger advices from China and increased interest by consumers. Trade interest, however, was not maintained at a level to warrant the higher quotations, and the market eased off. Recent demand for prompt delivery was fairly good, with Chinese regulus quoting 10⅞c duty paid. Futures were available at the same price, but buyers displayed little interest in forward shipments. Stocks of antimony in bonded warehouses on September 1 amounted to 4,381,597 pounds, compared with 1,440,296 pounds on September 1, 1926.

QUICKSILVER

The market for quicksilver showed a continued upward tendency lately. Price has advanced to $127 and possibly higher, and considerable interest is taken in the market. The tone became strong after the recent sale of the Spanish output for 1927-28. Consumers were active in the market on the rising tendency. Imports of quicksilver for the first eight months of this year were only 1,190,814 pounds, as compared with 1,451,448 pounds in the corresponding period in 1926.

PLATINUM

The past month has brought no special changes in prices of platinum. Pending inquiry was not pronounced enough to lift values, and refined platinum continues to quote $65 to $66 per ounce.

SILVER

The silver market is more active and firmer than it was a few weeks ago, with India and China both showing interest as buyers at close of month. Actual price is quoted at 56⅞ cents per ounce on orders as this report is closed. There is a feeling in well-posted circles that the large stocks of low-grade silver in India are not likely to be thrown on the market recklessly. It is not likely that this government will purchase any more silver at $1 per ounce under the requirements of the Pittman Act. Secretary Mellon is opposed to this proposition, and it is probable that any attempt in this direction will fail.

OLD METALS

Trade in scrap metals has been rather quiet lately, but prices on the copper and brass grades have been well maintained. Renewed activity is looked for as requirements for both domestic and foreign account develop. The market for scrap aluminum was quite unsettled by the reduction in virgin ingot, and the actual condition of the market has been unsettled. Zinc grades are also dull, and it appears to be a buyer's market for the present. New York prices are quoted at 10½c to 10¾c for heavy copper, 9¼c to 9½c for light copper, 6¾c to 7c for heavy brass, 5¼c to 5⅜c for heavy lead, 3½c to 3¾c for old zinc, and 18c to 18½c for aluminum clippings.

Daily Metal Prices for the Month of October, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	3	4	5	6	7	10	11	12*	13	14	17	18
Copper c/lb. Duty Free												
Lake (Delivered)	13.25	13.25	13.375	13.375	13.375	13.375	13.375	....	13.375	13.375	13.375	13.375
Electrolytic (f. a. s. N. Y.)	13.15	13.25	13.25	13.25	13.25	13.25	13.25	....	13.35	13.35	13.35	13.35
Casting (f. o. b. Ref.)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	....	12.75	12.75	12.75	12.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.												
Prime Western	6.00	6.00	6.05	6.05	6.05	6.10	6.10	....	6.125	6.10	6.075	6.05
Brass Special	6.05	6.05	6.10	6.10	6.10	6.15	6.15	....	6.175	6.15	6.125	6.10
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	59.25	59.50	58.625	58.375	58.50	58.50	57.875	....	58.125	58.875	58.125	58.75
Pig 99%	58.125	58.50	58	57.375	57.75	57.75	57.00	....	57.00	57.625	57.125	57.50
Lead (f. o. b. St. L.) c/lb. Duty 2½ c/lb.	6.00	6.00	6.05	6.00	6.00	6.00	6.00	....	6.05	6.05	6.075	6.05
Aluminum c/lb. Duty 5c/lb.	26	26	26	26	26	26	26	....	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	....	35	35	35	35
Shot	36	36	36	36	36	36	36	....	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	....	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	10.875	10.875	11	11.375	11.375	11.375	11.25	....	11.25	11.125	11.125	11.125
Silver c/oz. Troy Duty Free	55.50	55.625	55.75	55.50	55.625	55.875	55.75	....	55.875	56.125	56.25	56.50
Platinum $/oz. Troy Duty Free	66	66	66	66	66	66	66	....	66	66	66	66

*Holiday.	19	20	21	24	25	26	27	28	31	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Delivered)	13.375	13.375	13.375	13.375	13.375	13.375	13.375	13.375	13.375	13.375	13.25	13.363
Electrolytic (f. a. s. N. Y.)	13.35	13.35	13.35	13.35	13.35	13.35	13.35	13.35	13.35	13.35	13.15	13.31
Casting (f. o. b. Ref.)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.												
Prime Western	6.025	6.00	6.00	5.975	5.925	5.90	5.90	5.85	5.85	6.125	5.85	6.006
Brass Special	6.10	6.10	6.05	6.05	6.025	6.00	5.975	5.95	5.90	6.175	5.90	6.07
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	58.875	58.375	58.75	59.	58.50	58.75	58.	57.75	57.50	59.50	57.50	58.50
Pig 99%	57.625	57.375	57.75	58.125	57.75	58.	57.375	57.	56.875	58.50	56.875	57.581
Lead (f. o. b. St. L.) c/lb. Duty 2½ c/lb.	6.05	6.05	6.00	6.00	6.00	6.00	6.00	6.00	6.05	6.075	6.00	6.021
Aluminum c/lb. Duty 5c/ lb.	26	25	25	25	25	25	25	25	25	26	25	25.60
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	11.00	11.00	11.00	11.00	11.00	10.75	10.75	10.875	11.00	11.375	10.75	11.056
Silver c/oz. Troy Duty Free	56.375	56.25	56.125	56.125	56.125	56.25	56.25	56.125	56.625	56.625	55.50	56.031
Platinum $/oz. Troy Duty Free	66	66	66	66	66	66	66	66	66	66	66	66

Metal Prices, November 7, 1927

NEW METALS

Copper: Lake, 13.50. Electrolytic, 13.50. Casting, 13.125.
Zinc: Prime Western, 5.70. Brass Special, 5.75.
Tin: Straits, 56.50. Pig, 99%, 55.875.
Lead: 6.00. Aluminum, 25.00. Antimony, 10.875.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $128.00. Bismuth, $1.85 to $2.00.
Cadmium, 75. Cobalt, 97%, $2.60. Silver, oz., Troy, 57.375.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $66.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¾ to 10¾
Brass Ingots, Red	12 to 13
Bronze Ingots	12½ to 16
Casting Aluminum Alloys	21 to 24
Manganese Bronze Castings	23 to 40
Manganese Bronze Ingots	12 to 16
Manganese Bronze Forging	32 to 40
Manganese Copper, 30%	25 to 35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼ to 19¾
Phosphor Bronze	13½ to 15
Phosphor Copper, guaranteed 15%	17½ to 21
Phosphor Copper, guaranteed, 10%	16 to 20
Phosphor Tin, guaranteed 5%	75 to 80
Phosphor Tin, no guarantee	66 to 75
Silicon Copper, 10%.....according to quantity.....	28 to 32

OLD METALS

Buying Prices		Selling Prices
11¼ to 11¾	Heavy Cut Copper	12¾ to 13¼
10¾ to 11¼	Copper Wire	12¼ to 12½
9¼ to 9¾	Light Copper	10¾ to 11
9 to 9½	Heavy Machine Composition	10 to 10¼
7½ to 7¾	Heavy Brass	8¼ to 9
6¼ to 6½	Light Brass	7½ to 7¾
7¼ to 7½	No. 1 Yellow Brass Turnings	8¾ to 9¼
8¼ to 8¾	No. 1 Composition Turnings	9¾ to 10¼
6¼ to 6½	Heavy Lead	7¼ to 7½
4¼ to 4½	Zinc Scrap	5¼ to 5¾
10 to 11	Scrap Aluminum Turnings	13 to 15
14½ to 15	Scrap Aluminum, cast alloyed	18 to 19
20 to 20½	Scrap Aluminum, sheet (new)	22½ to 23
38 to 40	No. 1 Pewter	42 to 44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	21c. to 22c. net base
From stock	22c. to 23c. net base

BARE COPPER WIRE

15¼c. to 15½c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20½c. net base
100 lbs. to 200 lbs. in one order	21c. net base

ZINC SHEET

	Cents per lb.
Duty sheet, 15%	
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	10.00 net base
Casks, jobbers' price	10.50 net base
Open Casks, jobbers' price	10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38 c.
Aluminum coils, 24 ga., base price	32½c.
Foreign	40 c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finish Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 57½c. to 59½c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect August 2, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¼	$0.19¾	$0.21¾
Wire	.18¾	.20¼	.22¼
Rod	.16	.20½	.22½
Brazed tubing	.26¼	....	.31½
Open seam tubing	.26¼	....	.31½
Angles and channels	.29¼	....	.34½

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅛c. to 24⅛c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18¼c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19¼c. net base
Muntz or Yellow Metal Rod	16¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26 c.	10% Quality	29 c.
15% "	27½c.	15% "	32¾c.
18% "	28¾c.	18% "	36 c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, November 7, 1927

ANODES

Copper:	Cast	20¼c. per lb.	**Nickel:**	90-92%	45c. per lb.
	Rolled	19⅝c. per lb.		95-97%	47c. per lb.
	Electrolytic	18½c. per lb.		99%	49c. per lb.
Brass:	Cast	19¼c. per lb.	**Silver:**	Rolled silver anodes .999 fine are quoted from 59¼c. to 61¼c. Troy ounce, depending upon quantity purchase.	
	Rolled	19⅝c. per lb.			
Zinc:	Cast	13c. per lb.			

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$32.40–34.40
14" 20 ply 64/68 Unbleached	40.30–44.30
12" 20 ply 80/92 Unbleached	34.25
14" 20 ply 80/92 Unbleached	46.40
12" 20 ply 84/92 Unbleached	38.95–43.65
14" 20 ply 84/92 Unbleached	52.80–59.20
12" 20 ply 80/84 Unbleached	39.40–39.55
14" 20 ply 80/84 Unbleached	53.05–53.60

Sewed Pieced Buffs, per lb., bleached 55-70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11–.16	Iron, Sulphate (Copperas), bbl	lb.	.01½
Acid—Boric (Boracic) Crystals	lb.	.12	Lead Acetate (Sugar of Lead)	lb.	.13¾
Chromic, 125 lb. drums	lb.	.25	Yellow Oxide (Litharge)	lb.	.12½
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02	Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Hydrochloric, C. P., 20 deg., carboys	lb.	.06	Nickel—Carbonate dry, bbls	lb.	.29
Hydrofluoric, 30%, bbls	lb.	.08	Chloride, bbls.	lb.	.17–.18
Nitric, 36 deg., carboys	lb.	.06	Salts, single 300 lb. bbls	lb.	.10½
Nitric, 42 deg., carboys	lb.	.07	Salts, double 425 lb. bbls	lb.	.10
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05–.06
Alcohol—Butyl	lb.	.19-23½	Phosphorus—Duty free, according to quantity		.35–.40
Denatured, bbls.	gal.	.59	Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¾
Alum—Lump, Barrels	lb.	.03¼	Potassium Bichromate, casks (crystals)	lb.	.08½
Powdered, Barrels	lb.	.042	Carbonate, 96-98%	lb.	.07½
Aluminum sulphate, commercial tech	lb.	.02⅜	Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Aluminum chloride solution in carboys	lb.	.06½	Pumice, ground, bbls.	lb.	.02½
Ammonium—Sulphate, tech. bbls	lb.	.03¾	Quartz, powdered	ton	$30.00
Sulphocyanide	lb.	.65	Rosin, bbls.	lb.	.04½
Arsenic, white, kegs	lb.	.05	Rouge, nickel, 100 lb. lots	lb.	.25
Asphaltum	lb.	.35	Silver and Gold	lb.	.65
Benzol, pure	gal.	.60	Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Borax Crystals (Sodium Biborate), bbls	lb.	.04½	Silver Chloride, dry	oz.	.86
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Cyanide (fluctuating)	oz.	.60
Carbon Bisulphide, Drums	lb.	.06	Nitrate, 100 ounce lots	oz.	.40½
Chrome Green, bbls.	lb.	.28	Soda Ash, 58%, bbls	lb.	.02½
Chromic Sulphate	lb.	.37	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Copper—Acetate (Verdegris)	lb.	.37	Hyposulphite, kegs	lb.	.04
Carbonate, bbls.	lb.	.16–.17	Nitrate, tech., bbls.	lb.	.04¾
Cyanide (100 lb. kegs)	lb.	.50	Phosphate, tech., bbls	lb.	.03¾
Sulphate, bbls.	lb.	.05¾	Silicate (Water Glass), bbls	lb.	.02
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27	Sulpho Cyanide	lb.	.45
Crocus	lb.	.15	Sulphur (Brimstone), bbls	lb.	.02
Dextrin	lb.	.05–.08	Tin Chloride, 100 lb. kegs	lb.	.42½
Emery Flour	lb.	.06	Tripoli, Powdered	lb.	.03
Flint, powdered	ton	$30.00	Wax—Bees, white ref. bleached	lb.	.60
Flour-spar (Calcic flouride)	ton	$75.00	Yellow, No. 1	lb.	.45
Fusel Oil	gal.	$4.45	Whiting, Bolted	lb.	02½–.06
Gold Chloride	oz.	$14.00	Zinc, Carbonate, bbls	lb.	.11–.12
Gum—Sandarac	lb.	.26	Chloride, casks	lb.	.06¾
Shellac	lb.	.59–.61	Cyanide (100 lb. kegs)	lb.	.41
			Sulphate, bbls.	lb.	.03½